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中国生物圈保护区可持续管理案例研究丛书

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内 容 简 介

本书对锡林郭勒生物圈保护区草场退化的现状、原因以及从可持续利用和发展的角度提出可能的解决途径和草地生态系统的管理办法。本书用中文和英语撰写，前一部分为中文部分，后一部分为英文部分。全书分为 8 章，前 2 章描述锡林郭勒生物圈保护区建立之初的背景及目前所面临的问题；第 3 章至第 5 章用可持续利用和发展的观点阐述生态旅游和城镇化替代畜牧业的可行性；后 3 章为保护区的管理提出建议。

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《锡林郭勒生物圈保护区退化生态系统管理》编委会成员

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序　一

自从1956年建立第一个自然保护区以来，到2000年底，我国有各类自然保护区1276个，占国土面积的12.44 %。其中国家级155个，世界生物圈保护区21个。这是一个令全世界瞩目的成就。这些保护区的建立无疑为保存我国丰富的自然资源做出了巨大的贡献。中国的自然生态系统由于历代开发消耗、灾害损坏、战火破坏，尤其是近几十年来人口剧增，能够保存到今天实属不易，这是我国经济可持续发展赖以实现的重要自然资源基础，对它们的保护刻不容缓。自然保护区就是就地保护人类赖以生存的生物多样性和自然生态系统，世界上许多发达国家都把自然保护区的建设管理水平作为社会文明与环境健康的重要标志。因此，自然保护区事业是既造福于当代，又给子孙后代留下宝贵自然遗产的“积德”事业。

但是在我国的大部分地区，甚至是在自然保护区内，生态系统面临的严重问题是它们的退化，从而造成的生态系统生物生产力的下降、结构的简单化以及功能的丧失。如果我们回顾一下历史可以对这个过程看得很清楚，比如今天的陕、甘等严重的沙化、荒漠化地区，在历史上曾经是植被良好的富庶之地，否则周（公元前1066—公元前221）、秦（公元前221—公元前206）、汉（公元前206—公元220）、唐（公元618—公元907）等13个朝代就不会在陕西建都。生态系统退化的治理需要一代人甚至几代人的努力。然而，我国的大部分经济欠发达的地区，尤其是西部地区，如不立即停止普遍存在的低效益、高破坏性的社区发展模式，如陡坡开垦、过度放牧、围湖围海造田、竭泽而渔等，则很难在短期或中期有所作为。因此，对于退化生态系统的恢复，正确对待人与自然的关系非常重要，否则的话，任生态系统退化下去，还会诱导其他严重的生态环境问题，如黄河断流、长江洪水泛滥、荒漠化扩大、沙尘暴频次加大、水土流失、病虫害爆发、山体滑坡、泥石流、干旱化加重，等等。现在，国家正在很多地区实施天然林保护工程、退耕还林还草工程、自然保护区工程等措施，旨在逐步恢复退化的生态系统，改善环境。自然保护区在这些退化生态系统恢复与生态建设当中，应当发挥其重要的作用。由于我国自然保护区的40%位于西部地区，25%位于贫困地区，在这些地区的自然保护区中，生态恢复管理的问题更严峻、更现实。

自然保护区面临的普遍问题是如何解决保护与发展之间的巨大矛盾。这个矛盾解决不好，就会造成生态系统的退化，社区的经济与文化水平难以提高。在这方面，生物圈保护区的概念就是一个创造。这个概念是由联合国教科文组织（UNESCO）人与生物圈计划（MAB）的一个工作小组于1971年提出的，获得了联合国环境计划署（UNEP）、联合国

粮农组织(FAO)以及国际自然保护联盟(IUCN)的赞同,并于1976年开始实施。生物圈保护区的目标是使全球的典型陆地或海洋生态系统类型既要具有保护功能,又要促进可持续发展,并且有强大的后勤支持功能,从而科学地解决长期以来保护与发展之间存在的矛盾。自1979年以来,我国已有21个保护区加入世界生物圈保护区网络。世界生物圈保护区的建立,为国家的其他类型保护区的管理起到了重要的示范作用。尽管如此,由于国家对世界生物圈保护区管理缺乏有效的投入,同其他类型的保护区一样,世界生物圈保护区也存在生态系统退化、与经济发展脱节、管理理念落后等问题。为了真正解决这些问题,有必要对具体的保护区进行解剖分析,寻找相应的对策。为此,中国人与生物圈国家委员会发起了系列案例研究,锡林郭勒生物圈保护区是该项研究的第一个案例,其研究成果中提到的一些对策和建议,如对内蒙古大范围生态退化的防治、正确处理城镇与自然保护区的关系、发挥生态旅游在经济发展中的替代作用以及建立有效的保护管理体系等观点,不乏创新之意。因此,在这一研究成果出版之时,我非常愿意为此书写点什么,并希望能够引起有关方面的重视。是为序。

许智宏

中国人与生物圈国家委员会主席

中国科学院院士

北京大学校长

2002年3月10日

FOREWORD I

Since the establishment of the first nature reserve in 1956, China had proclaimed further 1276 nature reserves by 2000, occupying 12.44% of the nation's territory, including 155 national-level reserves and 21 world biosphere reserves. This accomplishment has attracted the attention of the whole world. The establishment of these nature reserves has without a doubt made a tremendous contribution towards preserving China's rich natural resources. As a result of natural and manmade disasters and destruction from war during the previous dynasties, China's natural ecosystem has been seriously depleted. In particular, this depletion has witnessed a marked increase during the past several decades due to sharp population increase. Therefore the task of preserving China's remaining natural resources is not easy. However, it is essential to immediately protect the foundations of the nation's important natural resources to ensure the sustainable development of the economy. These nature reserves ensure the survival of humanity by protecting the biodiversity and the natural ecosystem of local areas.

The establishment and management of quality nature reserves in many developed countries symbolize the modernization of society and the health of their environment. Therefore, the "benevolent" undertaking of nature reserves to preserve our precious natural heritage will not only benefit the current generation, but also future generations. However, China's ecosystem is confronted by the serious problem of degradation throughout the country and even within her nature reserves. As a result of this degradation, the strength of the ecosystem has been reduced causing a simplification of the structure and a lose of its function. It is possible to clearly see this process at work by reviewing the historical experience, for instance the serious areas of degradation and desertification today in Shaanxi, Gansu and other regions. Historically, these regions contained rich and popular wilderness areas. As a result, Shaanxi was home to the capitals of 13 Chinese dynasties, including the Zhou(1066BC—221BC), Qin(221BC—206BC), Han(206BC—220) and Tang(618—907). However, the current degradation of the ecosystem may possible require more than just one generation or even several generations of hard work from the government. Moreover, many regions throughout the country still

lack economic development, especially the western regions.

If we are unable to cease the highly destructive activities to social development such as the reclamation of steep slopes, over-grazing, the reclamation of lakes and coastal areas for cropping and the exhaustion of fishing stocks, etc. , then it will be very difficult to achieve such benefits in the short to medium term. Consequently, it is essential that we correctly deal with the relationship between man and nature if we want to restore the degraded ecosystem. Otherwise, if the degeneration of the ecosystem continues to worsen, then more serious repercussions will develop, for example, the drying up of the Yellow River, desertification, an intensification of sandstorm occurrence, soil erosion, the eruption of serious disease, landslides, land slips and droughts etc. Currently, many districts are implementing natural forest protection projects , the return of farmland to forests and grasslands projects, and nature reserve projects etc. Nature reserves should play an increasingly vital role in the restoration and protection of these degraded ecosystems. Due to the fact that 40% of China's nature reserves are located in the underdeveloped western regions and 25% are located within impoverished areas, the problem of restoring the ecology and management of these areas is of utmost seriousness and of the highest priority.

In general all nature reserves are confronted with the enormous problem of resolving the contradiction between development and conservation. If this contradiction is poorly resolved, it will only lead to more serious degradation of the ecosystem and therefore make the task of improving the economic and cultural level of society more difficult. In addressing this problem, the biosphere reserve concept is one possible creation. This concept was proposed and launched in 1971 by one of UNESCO's (United Nations Educational, Scientific and Cultural Organization) working party's, the Man and the Biosphere Programme (MAB). With the endorsement of the UNEP (United Nations Environment Program), FAO (World Food & Agricultural Organization of the United Nations) and IUCN (The World Conservation Union), the programme commenced in 1976. The aim of biosphere reserves is to ensure the global coverage of representative terrestrial and marine ecosystems, which offer distinct conservation functions, as well as promote sustainable development. Moreover, they promote a logistic function and thereby attempt to scientifically resolve the long-term contradictions which exist between conservation and development. Since joining the World Biosphere Reserve Network in 1979, China has already successfully nominated 21 member reserves.

The establishment of these biosphere reserves plays an important demonstration role for improving the management of other nationally significant nature reserves. Still, as a result of ineffective investment in the management of China's biosphere reserves, similar to the situation in other nature reserves, many problems persist, including, the ongoing deterioration of the ecosystem, a detachment from economic development and

an under-developed understanding of management. In order to fully resolve these problems it is necessary to carry out an analysis of the concrete situation in China's nature reserves and an examination of the relevant countermeasures.

Therefore, the national committee for China's Biosphere Reserve Network (CBRN) has initiated this case study research. This research of Xilingol Biosphere Reserve is the first of its kind and its achievements are to be published shortly. These results include significant reference to the necessary countermeasures and suggestions for resolving the existing degradation of Inner Mongolia's ecosystem, for instance by: utilizing the biosphere reserve concept to control ecological degradation; appropriately dealing with the relationship between the urban and rural sectors within the nature reserve; promoting substitute industries which advance economic development, while also benefiting the system of conservation management in areas such as ecotourism. There is no shortage of ideas for improving the current situation. Therefore, it is with pleasure that I introduce this book, especially in the hope of increasing the awareness of the issues and of arousing the attention of the relevant interests.

Xu Zhihong

President of the Chinese National Committee
for Man and the Biosphere Programme
Academician of Chinese Academy of Sciences
President of Peking University
10 March 2002

序　二

锡林郭勒草原自然保护区是在华夏大地上列入世界生物圈保护区网络的第一个草地类型的自然保护区。它的兴建实现了草原儿女历史性的夙愿，引起了人们广泛的关注。

中国人与生物圈国家委员会对锡林郭勒生物圈保护区的健康成长给予了多方面的支持。继 1994 年按照联合国国际生物圈保护区管理标准进行过全面评估之后，于 2001 年又组织多位知名生态专家开展了《锡林郭勒生物圈保护区可持续管理案例研究》。这份研究报告，针对该保护区在发展过程中出现的诸多社会、生态和经济问题进行了分析，重点对锡林河流域草原植被退化成因，保护区境内的城镇化和石油、煤炭资源开发对草原环境的影响，以及方兴未艾的生态旅游等问题进行了全面的分析讨论，提出了许多有益的见解。特别令人高兴的是，专家们对多年困扰保护区发展的管理制度问题，在进行认真总结与反思的基础上，提出了一个全新的管理体系框架，明确指出：

(1) 必须树立锡林郭勒生物圈保护区的建设和管理为全流域生态可持续发展服务的观点。

(2) 保护区管理委员会就是权威性的、公共利益的代表者和行使政府职能的协调监督机构，而不是一般被动的护理单位。

(3) 保护区管理委员会要制定有科学依据和法律作用的保护区总体规划，作为中长期建设的依据。

(4) 重新调整保护区功能区划空间结构势在必行。扩大核心区面积，可增强海流特典型草原生物多样性保护效应和生态系统服务功能，从而实现大面积有效管护草原与环境的总体目标，同时，还可以进一步提高锡林郭勒生物圈保护区的国际保护区的地位。

我对这些观点非常赞赏，并希望能引起政府和有关部门领导的重视，能够早日付诸实施，为我国草原自然保护事业做出有益的贡献。

雍世鹏

内蒙古大学生命科学学院教授

2002 年 1 月 22 日

FOREWORD Ⅱ

Xilingol Grasslands Nature Reserve was the first grasslands nature reserve in China to join the World Biosphere Reserve Network. The development of the grasslands has been a long cherished wish of the people, which has aroused the widespread attention and interest of the people. The Chinese National Committee for the Man and the Biosphere Programme (MAB) have provided a great deal of support for the long-term health of Xilingol Biosphere Reserve.

After China MAB carried out a complete appraisal of the China biosphere reserve network in 1994 according to UNESCO's World Biosphere Reserve management standards, then in 2001 they have once again carried out the following research, "A case study on the sustainable management of Xilingol Biosphere Reserve" by a number of ecological experts.

This research report is aimed at carrying forward the research and analysis of the social, ecological and economic problems that have arisen during the development of the nature reserve. This research mainly focuses on the causes of degradation to the vegetation and grasslands within the Xilin River catchment. The research has been carried out through discussions with the various stakeholders and by analysing the many aspects of the problems, including the relationship between the urban and rural industries within the nature reserve, the utilization of its natural resources, like petroleum and coal and the impact of this extraction upon the grasslands environment, as well as the gradual expansion of ecotourism. This research project has also raised many instructive suggestions and solutions aimed at resolving the apparent contradictions. Especially encouraging is that after conducting a thorough summing up and reappraisal of the basic issues, these specialists have suggested a completely new framework for the system of management, with the following suggestions:

(1) The comprehensive management aims of the nature reserve need to consider servicing the ecological sustainable development in whole region.

(2) The nature reserve management committee should be authorized to represent the common interests and perform the administrative function of promoting cooperation

and monitoring, rather than continuing to act as a passive administrator.

(3) The nature reserve management committee must be established according to a scientific and legal basis so as to ensure the coordinated programming of the nature reserve, according to a medium and long-term time-frame.

(4) It is necessary to restructure the biosphere reserves functional areas and expand the coverage of the core area so as to increase the effective biodiversity conservation and the ecological service function of the Hailiute typical grasslands. As a result of increasing the size of the core area, the common aim of improving the management of the grasslands and the regional environment will be closer. Furthermore, this will further raise the international significance of Xilingol Biosphere Reserve.

I fully support these proposals and I hope they will arouse the attention of the relevant government and departmental leaders. So that it will be possible to reverse the current problems and implement these suggestions in order to immediately realize the common benefits of managing China's grasslands nature reserves.

Professor Yong Shipeng

The Faculty of Life Sciences

Inner Mongolia University

22 January 2002

序　三

锡林郭勒生物圈保护区可持续管理案例研究项目是由中国人与生物圈国家委员会于2001年启动，它是加拿大国际开发署(CIDA)和联合国教科文组织(UNESCO)东亚生物圈保护区于1998年—2000年所支持的“中国自然保护区可持续管理政策评估”这一项目的延续。通过这项案例研究，研究人员认识到需要对引起目前环境退化问题的主要原因之间的内部联系进行深入分析，以便给中国有关部门决策提供第一手的详细资料。锡林郭勒生物圈保护区是将要进行的许多案例研究中的第一个。UNESCO北京办事处、雅加达办事处和巴黎总部都非常愿意对该研究提供帮助。

锡林郭勒生物圈保护区是中国典型草原生态系统的代表。过去在中国所建立的自然保护区中没有典型草原这一生态系统类型。本保护区是在20世纪80年代中期为进行科学研究和生物多样性保护而成立的，并于1987年被联合国教科文组织接受为生物圈保护区。锡林郭勒生物圈保护区不仅进行了长期的科学研究监测活动，而且围绕生物圈保护区的3个主要功能进行了许多科教活动和国际交流与合作。然而，正如许多科学家及当地政府所认识到的那样，锡林郭勒生物圈保护区的整体环境条件仍在逐渐恶化，植被退化，土地利用状况和地被物在发生变化。草地沙漠化面积扩大，而湿地面积缩小。如此严重的环境问题使该地区的可持续发展受到极大的威胁。因此我们要努力寻找能有效阻止该保护区自然环境进一步恶化的办法，并及时把它应用到实际工作中。通过详细的调查和准确的分析，本案例研究在达到这一目标方面已经迈出了重要的第一步。

从某种程度上说，锡林郭勒生物圈保护区的状况可以看作是当前内蒙古自治区大部分地区生态问题的缩影。中国人与生物圈委员会所做的努力不仅仅是为了锡林郭勒盟未来的发展，而是为整个自治区的发展和配合国家在防治荒漠化方面的工作。我们很高兴看到这个研究组在如此短的时间内取得了很多的研究成果，有些研究结果没有被总结到本书中。我希望研究组所得到信息，得出的结论和提出的建议，在保护区的管理阶层和当地社区中能够得到有效的和广泛的传播。我也希望在中国人与生物圈委员会的指导下，更多的案例研究将会继续进行下去。当然，为了提高生物圈保护区管理质量，UNESCO将随时为中国人与生物圈委员会提供必要的帮助。

对于那些对人与生物圈感兴趣的人来说，锡林郭勒生物圈保护区的案例研究是非常有意义的。本书中有关锡林郭勒生物圈保护区管理机制的探讨，生态旅游与地区经济发

展和保护之间关系的论述，以及城镇发展在生物圈保护区中的作用等问题都和人与生物圈委员会即将在国际和地区之间要上马的一些新项目有很大的联系。UNESCO 雅加达办事处非常感谢中国人与生物圈委员会为这些主题所做的努力，也希望在以后的项目执行过程中有更多的合作与交流。

韩群力

科技及环境项目官员

联合国教科文组织雅加达办事处

2002 年 2 月 23 日

FOREWORD Ⅲ

The case study on sustainable management of Xilingol Biosphere Reserve was initiated in 2001 by MAB China, in conjunction with the successful completion of an assessment on sustainable management work of the East Asian Biosphere Reserves during 1998-2000. The output of the policy study convinced its researchers about management policy for China's nature reserves project supported by CIDA and UNESCO within framework needs to go much further to analyse the interlinked underlying causes of the problems addressed by MAB-China, and to provide the country with a number of tangible, detailed and comprehensive cases for reference. Xilingol Biosphere Reserves was among the first sites for such case studies. UNESCO's Offices in Beijing, Jakarta and Paris were pleased to be able to provide their support to the study.

Xilingol Biosphere Reserve represents China's typical steppe ecosystem that used to be less covered in the conservation systems of the country. The area was set as a conservation and scientific reserve in mid of 1980's and was accepted as a biosphere reserve in 1987. In addition to its long-term scientific programme for research and monitoring, the Biosphere Reserve over the years has carried out many activities along the three functions of biosphere reserves, including international exchange and cooperation. However, as noted by scientists and local governments, the overall environmental situation in Xilingol has been deteriorating, with obvious degradation of vegetation, change of land cover and land use, enlargement of sandy land and shrink of wetlands, putting the sustainability of the site under a serious question. Effective counter measures must be found and applied as soon as possible. The case study has achieved a first step toward reaching such an objective through its detailed and convincing investigation and analysis.

In some ways, the situation in Xilingol Biosphere Reserve can be regarded as indicative for current ecological conditions of a large part of Inner Mongolia. The quest of MAB is thus not only significant for the future of Xilingol, but for the development of whole autonomous region as well as for the country's effort in combating desertification. We are very pleased to see the progress made by the project team in this short period of time, the rich results of which are not summarized in this special MAB

publication. I hope the information obtained, the conclusions and recommendations made by the team can be effectively communicated to the management authorities and local communities. We also hope that the case study be furthered with guidance from MAB China. As always, UNESCO will be ready to provide its assistance to MAB-China in order to improve the practice of biosphere reserves.

For those who are interested in current MAB agenda, the Xilingol study has a particular relevance. The papers on the management mechanisms in Xilingol, ecological tourism in relation to conservation and economic development of the area, and the roles of urban development in a biosphere reserve are strongly linked to the new subjects being addressed by MAB through international and regional taskforces. UNESCO Jakarta Office thanks MAB-China for making its effort in contributing to these MAB themes and expects more cooperation in pursuing the subjects.

Han Qunli

Programme Specialist for Science,

Technology and Environment

UNESCO Office Jakarta

23 February 2002

序 四

自1978年以来，在中国科学院和中国人与生物圈国家委员会的大力支持下，人与生物圈计划的概念在中国逐渐被人们所认识。目前，在中国已有21个自然保护区被纳入联合国教科文组织人与生物圈计划的世界生物圈保护区网络。

不论是在中国还是在世界各地，保护区的管理者都应不断努力以寻求新的方法去改善、提高保护区的管理水平，包括探索一些创新的管理模式，比如生态旅游。

每一个生态保护区都面临着各自不同的挑战以及发展和自然保护等相适应的问题。开展一个具有代表意义的自然保护区案例研究不论是对于保护区的领导人还是当地的居民都是非常有益的。锡林郭勒保护区案例研究为生物圈保护区的案例研究树立了一个很好的样本。此项研究主要着重于4个方面：① 自然保护区的生态背景及其保护存在的问题；② 生态旅游可持续管理存在的问题与对策；③ 城市及城镇与自然保护区的关系研究；④ 自然保护区管理的政策与对策研究。

锡林郭勒生物圈保护区坐落于内蒙古自治区，总面积为10 786km²，目前是中国境内面积最大的生物圈保护区，于1987年正式被纳入联合国教科文组织的世界人与生物圈网络，该保护区有着独特的当地文化和丰富的草场资源，极具发展生态旅游的潜力。

我非常高兴这本关于锡林郭勒保护区可持续管理的案例研究得以出版发行，借此机会我衷心地感谢相关人员，特别是中国人与生物圈国家委员会，对于锡林郭勒案例研究和此著作的出版所做出的贡献，以及他们对中国、亚洲乃至世界的自然保护事业所做出的不懈努力。我也希望这本著作能对锡林郭勒生物圈保护区的发展有所益处。

何贝尔

科技及环境项目官员

联合国教科文组织北京代表处

2002年2月23日

FOREWORD Ⅳ

Since 1978 the concept of the Man and the Biosphere (MAB) Programme has been gradually recognized and further developed in China, thanks to the strong support of the Chinese Academy of Sciences and to the Chinese National Committee for MAB. The number of Biosphere Reserves in China has been increased to a total of 21 during that period.

It is well recognized that the managers of Biosphere Reserves in China, as everywhere else in the world, should continuously be looking for ways to change and improve, if appropriate, the conservation management practices and use innovative ways and approaches such as ecotourism development.

Every single biosphere reserve faces its own challenges and has its specific potentials for development and nature conservation. It is important to develop site specific case studies in the biosphere reserves which may be of great benefit to the managers and the local population. This study represents a good example for a biosphere reserve case study, namely for the Xilingol Biosphere Reserve. It focuses on 4 areas: ① ecological background and existing problems for the development of the biosphere reserves; ② policy study for sustainable development of ecotourism; ③ relations between urban areas and biosphere reserves; ④ policy study on the management of biosphere reserve.

The Xilingol Biosphere Reserve is located in the Inner Mongolian Autonomous Region and is the largest Biosphere Reserve in China in terms of area (10,786 km^2). It was included into UNESCO's World Network of Biosphere Reserves in 1987. Endowed with its unique local culture and attractive grassland landscape, the Xilingol Biosphere Reserve offers a significant potential for further developing ecotourism, for instance.

I am very pleased to see that this book entitled Case Study on Sustainable Management in Xilingol Biosphere Reserve was published. I would like to take this opportunity to thank all concerned, especially the Chinese National Committee for Man and the Biosphere (MAB) Programme, for their great contribution to this publication and also for

their unremitting efforts in nature conservation in China, Asia and the world at large. Moreover, I wish that this publication may be of great benefit to the development of the Xilingol Biosphere Reserve.

Axel Hebel
Programme Specialist for Science,
Technology and Environment
UNESCO Office Beijing
15 February 2002

前　言

最早在中国大地上出现的自然保护区是 1956 年由中国科学院在广东建立的鼎湖山自然保护区。1978 年以后自然保护区建设进入了一个新高潮。截止 2001 年底为止，我国共有各类自然保护区 1276 个，保护区总面积占国土面积的 12.44%，其中，国家级自然保护区 155 个。20 世纪 70 年代中国加入了联合国教科文组织人与生物圈计划（Man and the Biosphere Programme，MAB），引入了生物圈保护区概念。1979 年，我国第一批保护区加入世界生物圈保护区网络。目前，我国有 21 个世界生物圈保护区。从战略意义上考虑，所有这些保护区的建立，旨在保护中国不同类型的生态系统，促进生物多样性的就地保护，改善国家整体生态环境状况，促进当地社区发展，无疑是非常重大的举措，是造福于当代又给子孙后代留下宝贵自然遗产的“积德”事业。但是，目前自然保护区的建设与管理存在着不少制约性的因素和困难，影响着自然保护区的可持续发展，除了众所周知的经费问题外，正确处理好保护与发展的矛盾是自然保护区面临的最主要问题。生物圈保护区概念为解决这一问题提供了方向，但是只有与当地的具体情况创造性地结合起来才能真正解决问题。

为了探讨和解决在中国这一特殊国情下，自然保护区在可持续管理方面存在的实际问题，中国人与生物圈国家委员会于 2001 年启动了系列案例研究项目。这是在 2000 年完成了“中国自然保护区可持续管理政策研究”项目基础上的深入和继续。考虑到我国北方存在的严重的生态退化与沙尘暴频发等严重问题，特选择我国惟一的草地类型生物圈保护区——锡林郭勒生物圈保护区作为该系列研究的第一个案例。这一项目得到了联合国教科文组织的经费支持，由中国人与生物圈国家委员会组织实施，参加单位包括来自中国科学院植物研究所、北京大学、内蒙古大学、澳大利亚墨尔本大学、澳大利亚查尔斯史特大学锡林郭勒国家级草原自然保护区的专家学者和管理人员。本研究针对锡林郭勒生物圈保护区存在的实际问题分 4 个专题展开：① 保护区的生态背景及其保护存在的问题；② 生态旅游可持续管理存在的问题与对策；③ 城市和城镇与自然保护区的关系研究；④ 保护区管理体制与政策。

参加本书编写的人员由上述单位的研究人员组成，主要编写人员如下：第 1 章陈佐忠、赵炳祥（中国科学院植物研究所）、杨贵卿、苗河（锡林郭勒生物圈保护区）；第 2 章仝川、雍伟义、雍世鹏（内蒙古大学生命科学学院）；第 3 章张倩、李文军（北京大学环境科学学院）；第 4 章李文军、李巍、黄甘霖（北京大学环境科学学院）；第 5 章蒋高明、刘美珍（中国

科学院植物研究所);第 6 章韩念勇(中国人与生物圈国家委员会)、杨贵卿、苗河(锡林郭勒生物圈保护区);第 7 章 Alex English(澳大利亚墨尔本大学);第 8 章 Rik Thwaites(澳大利亚查尔斯史特大学)提供英文稿,刘美珍译成中文,蒋高明校对;附录由苗河提供。全书由韩念勇、蒋高明、刘美珍统稿。

本项研究聘请雍世鹏教授和刘书润教授作为学术顾问并得到他们的指导。同时,本项研究报告是与锡林郭勒生物圈保护区管理局密切合作的成果,保护区管理人员钟启民、岱钦、赵海冥、阎云、杜占山、郝军、朱柏林、马飞、孙彦等参加了调查工作和提供了相应的资料。另外,本项目得到锡林郭勒旅游局、锡林郭勒统计局、锡林郭勒畜牧局、白音锡勒牧场、锡林浩特市环境保护局、市旅游局、城建局以及锡林郭勒盟政府、市政府等单位的大力支持,在此一并表示感谢。由于研究时间的限制,本书展现的仅为课题的初步成果和认识,不足之处敬请有关专家学者和领导批评指正。

中国人与生物圈国家委员会

2002 年 2 月 26 日

PREFACE

The first appearance of a nature reserve in China occurred in 1956 with the establishment of Dinghushan Nature Reserve in Guangdong by the Chinese Academy of Sciences. Since 1978, the construction of nature reserves entered a new era. By the end of 2001, China had established 1276 different types of nature reserves, covering 12.44% of the nation's territory and including 155 national-level reserves. During the 1970s, China joined UNESCO's Man and the Biosphere Programme and began to introduce the biosphere reserve concept. In 1979, China's first nature reserves joined the World Biosphere Reserve Network. Presently, China has designated 21 World Biosphere Reserves. The designation of these reserves has been considered as part of a strategic plan aimed at preserving China's distinctive ecological systems, increasing its biodiversity conservation in situ, improving its comprehensive ecological environment and promoting the development of the local community. Without a doubt, this was an extremely important decision which will not only benefit the present generation but also future generations through this "benevolent" undertaking of preserving our nation's precious natural heritage. However, the construction and management of China's nature reserves currently face a large number of complicated and difficult conditions, which are impacting upon their ability to carry out sustainable development. In addition to the obvious financial constraints, the most pressing problem facing China's nature reserves is how to resolve the contradiction between conservation and development. The biosphere reserve concept offers one possible solution for grappling with this problem, however only through working with specific local conditions is it possible to reconcile these problems.

In order to resolve and probe into the unique problems of the sustainable management of China's nature reserves, the Chinese National Committee for MAB commenced a series of case study examinations in 2001. This ongoing and in depth study builds upon the foundations of the completed report, "Study on Sustainable Management Policy for China's Nature Reserves (2000)". The current examination is being carried out in view of the existing serious problems of ecological degradation and increasing frequency of sandstorms facing northern China. This is the first investigation of its kind which

examines China's only Grasslands Biosphere Reserve, Xilingol Biosphere Reserve as the site for this case study research. This UNESCO funded research project has been undertaken by the Chinese National Committee for MAB and included many participants, including scholars from the Chinese Academy of Sciences (CAS) Institute of Botany, Peking University, Inner Mongolia University, and Australia's Melbourne University, Australia's charles sturt University as well as the management personnel from Xilingol National Grasslands Nature Reserve. This research is aimed at the existing problems facing Xilingol Biosphere Reserve and has chosen to focus on four specific research topics: 1) the existing problems of conserving the nature reserve's ecology; 2) the present problems and countermeasures for the sustainable management of ecotourism; 3) research on the relationship between the urban and the rural within the nature reserve; 4) the nature reserve's management system and policies.

The main individual and institutional contributors to this research include the following: Chapter 1-Chen Zuozhong,Zhao Bingxiang (CAS Institute of Botany), Miao He and Yang Guiqing (Xilingol Biosphere Reserve); Chapter 2-Tong Chuan, Yong Weiyi and Yong Shipeng (Life Sciences Department, Inner Mongolia University); Chapter 3-Zhang Qian and Li Wenjun (Center for Environmental Sciences, Peking University); Chapter 4-Li Wenjun, Li Wei and Huang Ganlin (Center for Environmental Sciences, Peking University); Chapter 5-Jiang Gaoming and Liu Meizhen (CAS Institute of Botany); Chapter 6-Han Nianyong (Chinese National Committee for MAB), Miao He and Yang Guiqing (Xilingol Biosphert Reserve); Chapter 7-Alex English (Department of Geography & Environmental Studies, the University of Melbourne, Australia); Chapter 8 English version is offered by Rik Thwaites (School of Environmental & Information Sciences, Charles Sturt University, Australia), translated by Liu Meizhen and checked by Jiang Gaoming (CAS Institute of Botany). Appendixes-Miao He (Xilingol National Grasslands Nature Reserve). This book was coordinated by Han Nianyong and Jiang Gaoming and edited by LuoJian and Liu Meizhen.

This research project invited professors Yong Shipeng and Liu Shurun to act as academic referees and received their guidance. At the same time, this research project is the product of the intimate cooperation of Xilingol Biosphere Reserve, including the following reserve management personnel: Zhong Qimin, Dai Qin, Zhao Haiming, Yan Yun, Hao Jun, Du Zhanshan, Zhu Boling, Ma Fei, Sun Yan and others, who participated in the investigation and raised a number of insightful contributions. In addition, we greatly appreciated the cooperation and support of the following: Xilingol Tourism Bureau, Xilingol Statistics Bureau, Xilingol Animal Husbandry Bureau, Baiyinxile Livestock Farm, Xilinhot Municipal Environmental Protection Bureau, Municipal Tourism Bureau, Municipal Urban Construction Bureau and the strong support of Xilingol League Administration and Xilinhot Municipal Administration. Due to a limited research

timeframe, this book has introduced some preliminary results and understandings of this complex issue. We welcome any criticism or comments and if there are any mistakes and omissions then please do not hesitate to point these out to the respective authors so that they may be corrected.

Chinese National Committee for MAB
2 March 2002

目　录

CONTENT

第 1 章

锡林郭勒生物圈保护区面临的生态问题

1.1 生物圈保护区的概况

我国有 4.0×10^6 km^2 草地，约占国土面积的 40%，主要有三大类型：温带草原、高寒草地与热带一亚热带草地，分布在我国北方的温带草原是天然草地的主体，它是地球表面欧亚大陆草原的重要组成部分。锡林郭勒大草原是温带草原最有代表性的类型。

锡林郭勒生物圈保护区位于锡林郭勒草原的中心，总面积 10 786 km^2。主要包括沙地森林生态系统、草原生态系统、农田生态系统、湿地生态系统等不同类型生态系统。其中，草原生态系统是主体，约占总面积的 90%以上，草原生态系统中最有代表性的是典型草原生态系统，其次是草甸草原生态系统（图 1-1）。

草甸草原生态系统主要分布于保护区的东部低山丘陵如乌拉苏太、沃村吐儒等处的山地及南部和东南部海拔高于 1 300 m 的熔岩台地，如灰腾梁及嘎松山周围地区，这一生态系统是温带草原生态系统中最湿润的类型，土层深厚，土壤肥力较高，植物种类丰富，保护区建立的查干敖包与灰腾希勒核心区就代表了这一类型。这一类型系统生产力较高，但一般远离水源，在自然条件下，是主要的割草场，锡林郭勒盟（盟相当于内地的市或地区）的贮草站即主要位于这一地区。另外，由于其土壤与气候条件较好，故常被作为宜农荒地而大量开垦，如沃村吐儒新开荒地、益和乌拉部分地段，最先开垦于50年代，以后有过 1956 年、1960 年和 1969 年三次高潮。开荒土地面积从 1953 年的200 余亩*到 1990 年的 164 800 亩，增加 800 倍以上。因此，不合理的割草制度、开垦和粗放耕作是这一类型生态系统退化的主要原因。典型草原生态系统是保护区内分布最广、面积最大的一类生态系统，也是我国温带典型草原生态系统最有代表性和典

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* 1 亩＝666.7m^2，余同。

图 1-1 锡林郭勒生物圈保护区生态系统类型图

型性分布的地区，广泛分布于保护区中部、北部和西部的丘陵与塔拉（丘间低地）。主要由于湿度的不同，这一类型生态系统的植物群落类型、组成、盖度、生产力等以及利用方式有一定差异。其中比较湿润的羊草典型草原生态系统，分布在丘陵谷地或塔拉间，除用来放牧、割草外，也有被开垦作农田，如巴彦希勒等地，但大部分为针茅典型草原生态系统，如黄花树特、海流特平原、桃林塔拉等地，水分状况一般比较干旱。在这一类型地区建立了海流特平原典型草原核心保护区，面积 5.5km^2，而这一类型主要利用方式为放牧与割草。也主要是过度的放牧与不合理的割草，导致这一类型生态系统的退化。

在保护区的中部还有横贯东西的一条沙地，这一沙地是内蒙古第四大沙地浑善达克沙地的一部分。主要由于沙地这一特殊的基质与起伏的地形，从而导致水分的再分配以及热量状况的变化，在沙地内分布有杨桦林生态系统、榆树疏林生态系统与沙地草原生态系统，保护区建立的阿布都尔图、陶乌音阿勒盖核心区就代表了这一类型。在长期的历史演化过程中，这些沙地的松散基质，绝大部分都已固定，虽然有少数流动沙丘，但并不破坏整个沙地生态系统生态平衡的大格局。但自 20 世纪 50 年代以来，在沙地内放牧居民点大量增加，尤其是冬季；另外一些不合理的樵采活动，使沙地不同程度的活化，裸沙地明显增加，沙地生态系统也呈现不同程度的退化。

湿地生态系统主要是指自然保护区内锡林河、扎根斯坦诺尔等河流湖泊，溪水水体及其周边地区的沼泽湿地。这一类型生态系统所占面积不大，如札根斯太诺尔，仅 1.68 km^2，平均水深 1.3 m，锡林河及其支流如来吐河等，长 10 km 到几十 km，锡林河平均水深 0.293 m，年径流量 $2.854\times10^6 m^3$。上述湿地生态系统虽然面积不大，但其地位十分重要。主要由于过度利用以及气候变化，这一生态系统也在退化之中。草原生态系统退化是我国面临的一个重大生态环境问题，国家环保局(1998)认为，我国 90%以上的草地都处于不同程度退化之中。李博(1997)指出，宁夏、陕西、山西三省退化草地的面积占 90%～97%。仝川等(2000)主要根据 1985 年和 1999 年遥感信息资料分析指出，保护区 1999 年草原退化的面积占草原面积的 81%，而且这种退化有增加的趋势。仝川等同时指出，在保护区内中度与重度退化草原的面积，1999 年比 1985 年分别增加了 38%和 47%。

什么是草原退化？草原为什么会退化？其退化的原因和过程是什么？如何治理退化？很值得研究，这也正是本文要讨论的问题。

1.2 什么是草原退化

草地退化是荒漠化的主要表现形式之一，关于草地退化有不同定义，这是不同学者从不同角度出发对同一事物得出的不同结论。李博等(1990)认为草地退化是指放牧、开垦、樵柴等人为活动下，草地生态系统远离顶极的状态。黄文秀等(1991)认为草地退化是指草地承载牲畜的能力下降，进而引起畜产品生产力下降的过程。陈佐忠(1988)则认为草地退化不仅是指草的退化，又指“地”的退化，是草地生态系统的退化。后来，又依据这一观点，陈佐忠、汪诗平(2000)提出了温带典型草原生态系统退化不同阶段植物、啮齿动物、土壤微生物、土壤等草原生态系统不同成分的相应指标(表 1-1)。

表 1-1 温带典型草原生态系统不同退化阶段的指标

退化等级	植物种类组成	地上生物量及盖度	地被物与地表状况	啮齿类指示	蝗虫类指示	土壤状况指示	土壤动物指示	土壤微生物指示	系统结构	可恢复程度
Ⅰ轻度退化	原生群落组成无重要变化，羊草、大针茅种群数量减少；冷蒿和冰草等小禾草比例增加	下降20%～35%	地被物明显减少	达乌尔鼠兔	小翅雏蝗	无明显变化，表层硬度稍有增加，有机质稍有下降	姬蚯蚓	枯草芽孢杆菌、茎点霉属或单端孢霉属细菌	无明显变化	围封后自然恢复较快
Ⅱ中度退化	冷蒿成为优势种，但仍保留有较大部分羊草和大针茅草原原生种	下降35%～60%	地被物消失	布氏田鼠	狭翅雏蝗	土壤硬度约增加1倍，有机质明显下降	鞘翅目和螨类	凝结草孢杆菌、束梗孢霉厚细菌	肉食动物减少，草食啮齿类增加	围封后可自然恢复
Ⅲ重度退化	原生种大半消失，种类组成单纯化，冷蒿、星委陵菜和小禾草占绝对优势	下降62%～85%	地表裸露	布氏田鼠	鼓翅皱膝蝗、宽须蚁蝗	表面硬度增加2倍左右，有机质含量更低，表土粗粒增多或明显盐碱化，出现碱斑	膜翅目	犁头霉属细菌	食物链明显缩短，系统结构简单化，功能失调	自然恢复困难，需加改良措施
Ⅳ极度退化	植被消失或零星分布星毛委陵菜及一年生杂草	下降85%以上	呈现裸地、沙化或盐碱斑	长爪沙鼠		失去利用价值			系统崩溃	需重建

1.3 退化过程与原因

锡林郭勒草原的利用已有千年以上的历史，但草原生态系统不断加剧的退化从白音锡勒牧场看，却主要是近 50 年以来的事，近 10 年越发明显，而 1999 年以来，其草原生态系统的生产者植物群落的退化更为严重，更为突出。图 1-2 则概括而定性表明了草原生态系统生产者植物地上部分退化的过程和趋势，它在一定程度上代表和反映了草地生态系统退化的过程和趋势。草原生态系统退化为什么会呈现这一过程和趋势？这与引起草原生态系统退化的原因有关。

草原生态系统退化是自然因素与人为因素，即气候变化与长期的不合理的放牧制度、

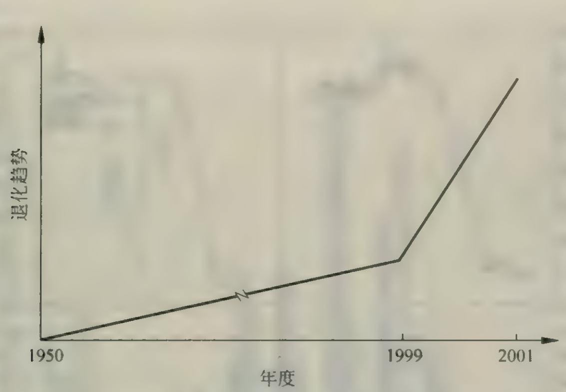


图 1-2　锡林郭勒草原草地退化过程示意图

割草制度与开垦共同作用的结果。不合理的割草制度，就其对物质循环影响的本质而言，是另一种形式的放牧，因为放牧与割草都是从草原生态系统中移走氮、磷、钾等营养物质，都是氮、磷、钾等营养元素输出的一种形式。不合理的放牧制度与放牧家畜的连续不断的增加与肉、奶、皮、毛畜产品及家畜的输出密切相关。图 1-3 为白音锡勒牧场 1950 年—2000 年人口以及大家畜牛、马和小家畜绵羊、山羊以及牲畜总头数在 50 年间的动态变化。

就人口而言，白音锡勒牧场建于 1950 年，当时仅有职工 20 人，以后随着事业发展不断增加，1962 年达到 5 139 人，12 年间，增加了 200 倍以上。1982 年达到最高峰，全场有人口 12 959 人，20 年间又增加了 1.5 倍。此后基本趋于稳定，乃至有所下降。2000 年全场有人口 10 210 人，是建场开始时的 510 倍(图 1-3A)。随着人口的增加，就要多养牲畜，因为以牲畜为主的畜牧业生产，是牧场的主要经济来源，故就牲畜总头数而言，建场开始时的 1950 年，各种牲畜总头数 1 023 头(只)，而 1999 年最高，达到 252 248 头(只)，是开始建场时的 240 倍(图 1-3F)。在此期间，主要由于改革以及市场经济的驱动，牛、马、绵羊、山羊等各种牲畜的比例有较大的变化。在 1975 年以前，马与牛等大牲畜发展较快，如 1975 年，本场有马 17261 匹，达到历史最高峰(图 1-3C)，而后有所下降，这是因为在 70 年代以前，本场作为种马场，故马匹数量大量增加。以后军马需求下降，马匹发展受到限制，相反绵羊与山羊尤其是山羊等小家畜在 80 年代以后有较快发展。1962 年，本场只有 2 283 只山羊，1997 年增加到 29 674 只，是 1962 年的 13 倍。这是因为山羊绒市场走俏，价格较高，牧民可以得到较高经济收入，因而大大刺激了山羊的发展。家畜的增加，加重了草场的压力，使每只家畜占有的草场面积大大减少。1950 年，每头(只)畜平均占有天然草地 350 hm^2，而过了 50 年，每只牲畜占有的天然草地只有 1.5 hm^2，缩小了 230 倍。

而保护区内在 2000 年以前所有的牲畜几乎全部依赖天然草地的放牧，如白音锡勒牧场 1990 年的人工草地与半人工草地只有 2 万亩饲料地和 2.6 万亩草库仑(围栏)，二者合计占全场总面积的 0.87%(内蒙古大学经济系、白音锡勒牧场课题组 1993)。因此，不断增加的牲畜加重了天然草地生态系统的压力，使之退化不断发生。退化速度的总趋势基本呈人们不易觉察的直线的速度增加。但自 1999 年，连续三年的异乎寻常的气候变化，

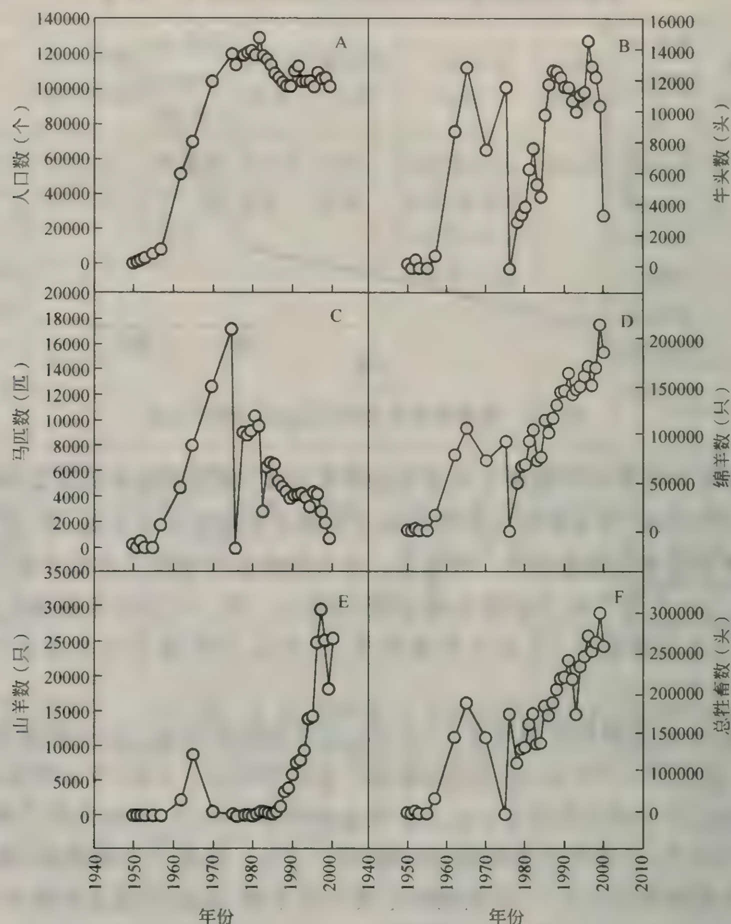


图 1-3　白音锡勒牧场(1950—2000)人口的动态(A)、牛头数动态(B)、马匹数动态(C)、绵羊只数动态(D)、山羊只数动态(E)和牲畜总头数动态(F)

加剧了退化的进程，在某种程度上改变了原来草地退化的走势。这一气候变化的总特点是温暖化与降水分配及降水形式的变化(图 1-4A,B)。

1999 年平均温度高于多年平均 1.0℃，其中最冷月(1 月)平均温度高 2℃，最热月(7 月)平均高 1.7℃。2000 年冬季温度较低，但 7 月较多年月平均温度高 3.7℃。从这两年温度几个指标看表现出温暖化的特征。另外，就降水而言，一方面年降水量低于多年平均值，1999 年和 2000 年比多年(1982—2000)平均分别少 16 mm 和 34 mm，这并不太显著，对植物生长影响最大的是降雨分配的不合理与降雨形式的变化。在这类草原地区，对植物生长影响最大的是 6 月下旬到 8 月中旬的降雨，因为进入 8 月中旬以后，温度开始下降，降雨即使很充沛，对植物生长也没有很大作用，而 1999 年和 2000 年，降水的时间分配不能满足植物生长需要。1999 年 7 月下旬、8 月上旬、中旬的旬降水量只有多年平均降水量的 4%，81.6%和 28%，而 2000 年 6 月下旬、7 月下旬的旬降水量只有多年平均旬降水量的 29%，14%，可以认为 1999 年 7 月下旬到 8 月中旬的 30 天，2000 年 6 月下旬到 7 月

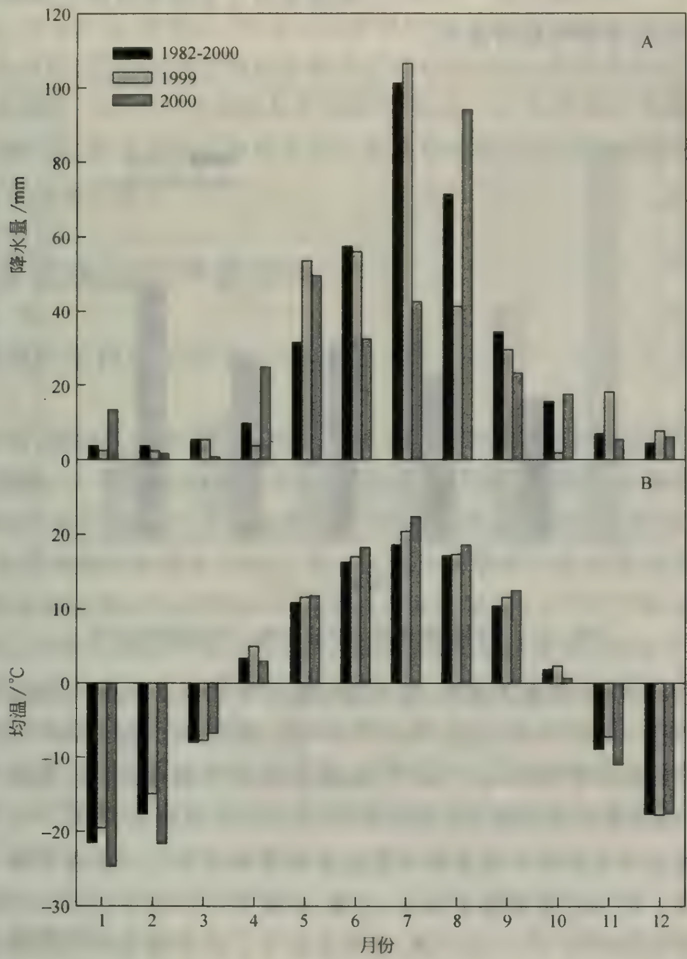


图 1-4　白音锡勒地区分别在 1999 年，2000 年和 1982 年—2000 年多年平均降水动态(A)和年均温动态(B)

下旬的 30 天降水量少，是草原植物受影响的关键时期。从降水看，降水的分配不合适，也是干旱化的一个标志，另据统计资料看，1999 年—2000 年暴雨形式有所增多，也是影响降雨效果的一个原因。

基于这样的分析，我们认为，草原生态系统的退化，其原因是"不良气候变化下的不合理的人类活动"。我们之所以得出这一结论，还基于下面的分析，即使同在一个保护区内，同在一个不良气候条件下，但退化的程度并不相同，如经多年封育，人类停止放牧活动没有干扰的围栏内，其植物种类组成、生产力与过度放牧的试验处理大相径庭。已进行了 13 年的长期放牧试验结果表明(李永宏等 1999)，在同一个自然条件下，未放牧的地段，其地上现存量最大值为 140.5g・m^{-2}，而随着放牧率的增加，其地上现存量最大值越来越低。如 1.33 羊・hm^{-2}，2.67 羊・hm^{-2}，4.00 羊・hm^{-2}，5.33 羊・hm^{-2} 和 6.67 羊・hm^{-2} 的 5 个放牧率，其地上现存量最大值分别为 81.70g・m^{-2}，75.39g・m^{-2}，63.10g・

m^{-2},44.40g·m^{-2},31.34g·m^{-2}。图 1-5 清楚表明了放牧率对地上现存量和采食量的影响,不同放牧率其采食率相差很大。

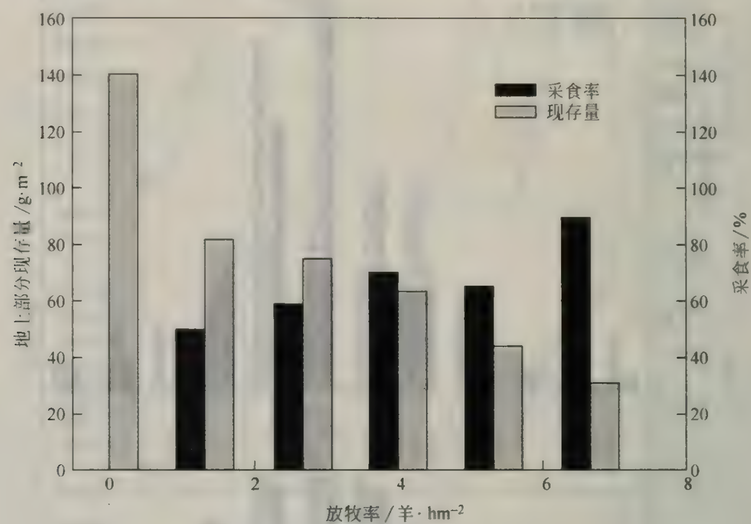


图 1-5 不同放牧率与采食率和地上现存量的关系

这一结果告诉我们,如果不放牧,地上现存量为 1 400kg·hm^{-2},而如果轻度放牧,地上现存量为 810kg·hm^{-2}～250 kg·hm^{-2},中度放牧为 630 kg·hm^{-2},重度放牧为 440 kg·hm^{-2},过度放牧只有 310 kg·hm^{-2},也就是说,对于轻度、中度、重度、过度等不同放牧强度,其地上现存量只有对照不放牧的 60%,45%,30%和 22%。

开垦对草原退化的影响不像放牧对退化影响那样面积大与进程缓慢,而是呈急剧变化与片断化分布。因为开垦的都是地形、土壤、植被等自然条件比较好的局部地段,因此其分布呈现片断化的特征,但一经开垦,就彻底破坏了原来覆盖的天然植被,改变了土壤腐殖质累积的自然过程,加速了有机质分解与释放,其退化的过程十分迅速,而其严重程度令人们难以预料,表现的形式与放牧引起的退化也有所不同。开垦为农田,最终可能引起严重的土地沙化与风蚀坑的形成。据调查(内蒙古大学经济系等 1993),原第十二分场播种的 5000 亩农田中,有 40%盐碱化,50%风蚀沙化,其中有 4 块直径 100m 的风蚀坑。汪久文对本区农田开垦进行的调查结果(1988)表明,天然草原开垦以后,表土有机质从 3.14%下降到 1.35%,全氮不及原来的一半。不仅如此,小于 0.01mm 的细土颗粒从占总量的 30.4%和 36.4%下降到仅占 11.7%和 16.8%,而 0.25mm～1mm 的颗粒从 31.4%～41%增加到 59.3%～59.6%,质地从粘壤土变为粗沙土。

从生物圈保护区管理的角度看,生态系统退化的一个重要原因是核心区面积太小。1987 年设立的 5 个核心区,总面积 18.5 km^2,占保护区总面积 0.17%。这犹如一个个孤立点,很难发挥其作用。

自然保护区内生态系统的退化除了上述技术与管理上的原因外,另一个很重要的原因是认识上的偏差。草原生态系统的功能有哪些?长期以来,我们对此缺乏全面的理解,由于复杂的和历史的原因,我们长期以来都把草原生态系统仅仅看重或者过分强调其经

济功能一面，认为其仅仅是重要的畜牧业基地，是生产肉、奶、皮、毛的地方。而对其保持水土、调节气候、改良环境、防治风沙、保存生物多样性与基因库等多方面的生态功能注意不多。我国北方草原，其中特别是锡林郭勒草原自然保护区，那是我国京、津地区和广大北方地区的生态屏障。这一生态功能与可能提供肉、奶、皮、毛的经济功能相比，具有同等重要的意义。这一点，从近几年频繁发生的严重的沙尘暴可以更深刻地体会到。生态系统的退化，其后果十分严重。

1.4 生态系统退化的严重后果

1.4.1 生物物种多样性的丧失

最近 30 年来，保护区生物物种多样性出现了许多令人不安的变化，最令人痛心的是一种珍稀濒危植物——单花郁金香的丧失（李永宏 1993）。单花郁金香是一种短命旱中生植物，早春开花，花大而艳丽，具有很高的观赏价值，在本保护区的出现，表明了蒙古草原地区与中亚地区和地中海地区植物区系在起源上的联系。它在本保护区分布面积不大，只是在伊和乌拉山顶火山石的碎石缝隙中才可以发现。1979 年在此处采得几份珍贵标本，多年来，科学工作者呼吁保护这种植物，但没有认真对待，由于在此处的过度放牧，破坏了单花郁金香赖以生存的生态环境，如今在保护区内找不到这种珍稀的植物了。另外，令人惋惜是黄羊的丧失，在 20 世纪 50 年代至 70 年代，在保护区内曾有成群分布，它是天然草原生态系统的重要组分，然而由于无节制的狩猎，如今很少见了。此外，由于生态系统的退化，生态环境的恶化，曾经闻名的口蘑、百灵鸟和黄花苜蓿也变得十分稀少了。

1.4.2 生产力降低

调查结果表明，不同程度退化生态系统的植物群落生产力比原生群落要下降 20%～100%，较之 20 世纪 50 年代要下降 60%左右。2001 年更为严重，在旱灾、风沙灾害、过度放牧以及蝗灾的影响下，某些针茅典型草原生态系统的现实生产力几近为零，成了光板地，秋天，地面仅残存灌木小叶锦鸡儿的被蝗虫啃食后的残枝以及少量不能食用的一年生植物猪毛菜。

1.4.3 植物群落结构简单

退化的草原生态系统植物群落结构与外貌也发生很大变化，植物个体小型化、矮化、植物种类组成有简单化的趋向，优良的牧草与有害或有毒植物的比例大大减少，有时看去只剩下有毒或有害植物。群落平均高度大大降低，盖度大大降低，地面的凋落物也大大减少，这也给沙尘暴发生提供了条件，因为试验表明，群落盖度低于 50%极易起沙。而据调查（李博 1988），典型草原群落的总盖度绝大部分都低于 50%，只有少数草甸草原在 50%

以上。

1.4.4 生态环境恶化

退化草原生态系统土壤的物理性状、化学性质与生物状况以及微气候环境都会恶化，虽然会有滞后表现，如土壤表层硬度增加，表层容重增加，严重的出现粗粒化和沙化，这给沙尘暴的发生提供了沙源这一物质基础。土壤腐殖质、全氮等肥力状况的表征都会下降。保护区退化草原生态系统如何治理是摆在我们面前十分突出的问题。

1.5 退化草原生态系统治理对策探讨

退化生态系统要实行分类治理，区别对待；要讲求实效；要长远安排；要综合治理。目前保护区的退化草原生态系统不是一个程度，有严重退化、中度退化、轻度退化之别。严重退化草原生态系统在白音锡勒牧场约有 100 万亩，占草场总面积 20%以上(内蒙古大学经济学系等 1993)。主要分布于居民点、村庄、锡林河及水源点周围地区、巴彦胡硕等地以及部分沙地。轻度退化草原生态系统主要分布于黄花树特、乌拉苏太、沃村吐儒等地，面积 100 万亩左右，约占全场总面积 20%左右。而(中度)退化的草原生态系统，约占全场总面积 60%左右，对上述三种类型应采取不同措施。

(1) 严重退化草原生态系统的治理，要采取坚决围封，令其自然恢复的办法。其中对严重退化而又可能引起沙化，极易起沙和为沙尘暴提供沙源的地段，如沙带内严重退化的地段，要作为围封的第一步，先行围封。对围封区域内的牧户要作为生态移民迁出，另行安置，据报导，内蒙古已启动生态移民工程，对生态环境恶劣、生存条件极差地方的牧民，作为生态移民，安置他处。在多伦，结合扶贫攻坚，2000 年与 2001 年已实施生态移民 237 户，共 933 人，可治理严重退化沙地 72 万亩。在本保护区，围封的严重退化的草地，当年即可收到较好的效果(图 1-6)。试验表明，1983 年围封的退化草地，1984 年产量即可提高 1 倍(陈敏等 1997)，一般经过 3 年，植物群落的恢复就可达到较高的水平，当然这种围封能在 1 年～3 年即可收到明显效果的退化草地，只要不是严重退化的草地，而是轻度退化的草地，同时围封后气候较好，对围封的地段，一般不需实施飞播等措施。因为即使这种严重退化的地段，土壤种子库仍保留有一定的种源和许多多年生植物，只要条件合适，可自然恢复。因为据仝川等人研究(2001)，在割一年休一年的割草场上，在 12cm 以上的土层里，每一亩地土壤库中，保存有活力种子达到 135 万粒以上，即每平方米有 2 032 粒。

(2) 对大面积中度退化的草地，要在适当禁牧的基础上合理利用，尤其是春季禁牧最为关键。要禁牧，要围封，就要减少现有牲畜头数。根据草畜平衡的原则，保护区现有牲畜大大超载(内蒙古大学经济系等 1993)。这大大超过最适宜载畜量，故必须减少现有牲畜头数，如何减？一个办法是对养畜超载大户，通过超载增加税收的办法加以限制；另外一个办法是清理“官办”牧场，而把在保护区内一切“吃皇粮”单位办的牧场，如部队、各级政府、事业单位为改善本单位职工生活而兴办的各类牧场，加以清理，还草原于牧民。据调查，白音锡勒牧场 1990 年暖季饲养的牲畜 33.65 万羊单位中，其中这种“官办”牧场有

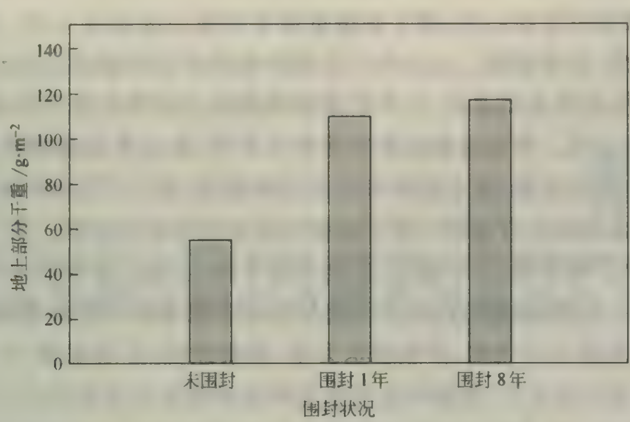


图 1-6　退化草地围封前后生物量的比较

2.1 万，占 6%，而冷季 25.08 万中，“官办”牧场有 1.5 万，占 6.0%（内蒙古大学经济学系等 1993）。第三，清理“义务放牧牲畜”，现在许多稍有权力的人，如与牧民有直接关系的公务员、兽医、司机等，利用职务之便，牧民义务代为放牧，其量也不少，对这种情况也应清理整顿。当然，对这些大面积中度退化的草地，在有条件的情况下要适当投入。

（3）对轻度退化与没有退化的草地，要在草畜平衡的原则下合理利用，目前比较可行的办法是围栏划区轮牧，对这一点，牧民尚不适应，但要逐步引导。

（4）因地制宜建立人工草地，走草地畜牧业集约化的道路。遵循草畜平衡原则，合理利用天然草地，发展草地畜牧业，这是问题的一个方面；另一方面，要积极创造条件，建立人工草地，增加饲草供应，缓解冬春季饲草矛盾，发展舍饲、半舍饲畜牧业，走集约化的道路。这被认为是草业结构调整的重点（郝益东 2001）。在保护区建立人工草地，要选择好地段，最好是丘间低地，河旁洼地以及撂荒地。在保护区内，这种面积不是很大，据估算，大致 10%左右，人工草地中多年生牧草与一年生饲草料搭配很重要。多年试验表明，多年生禾本科牧草中，羊草（*Aueurolepidium chinense*）、老芒麦（*Elymus sibiricus*）、无芒雀麦（*Bromus inermis*）等，豆科牧草中黄花苜蓿（*Madicago falcata*）、紫花苜蓿（*Madicago sativa*）、扁蓿豆（*Melilotides rutheuicus*）、草木樨（*Melilotus offieinalis*）等，一年生饲草中青贮玉米等（戚秋慧 1998）都很适合这一地区。

（5）运用综合措施，发展牧区经济，增加牧民收入，减轻对天然草场的压力，牧民生活要奔小康，牧区经济要发展，这是时代要求，也是大趋势。但长期以来，只有一条道，就是不断增加牲畜头数，各种措施也是刺激牲畜头数的增加。这不是长远之计。要想方设法，发展牧区经济，增加牧民收入，以减轻牲畜对草场的压力，如发展绿色产品，积极鼓励牧民参与发展生态旅游，提高出栏率等。

（6）从保护区管理的角度看，治理退化草地生态系统，下述几个方面也许更重要、更突出，也更紧迫。

① 扩大核心保护区，并调整核心保护区的功能。目前核心区面积占保护区总面积 0.17%，实在比例太小，即使这 0.17%保护再好，也对草地退化的大趋势影响不大。扩大核心保护区势在必行，2000 年提出的核心保护带的规划是很有意义的，这一核心保护带

意将现有海流特典型草原核心区、查干敖包草甸草原核心区连成一片。在核心保护带内严格管理、科学规划、合理利用。过去核心区实行绝对不动的做法可以讨论。事实上,没有动物的合理利用,草原也要退化,天然草原植物群落与动物群落共同生活,和谐相处是大自然长期选择的结果。曾在这里长期生活的黄羊等,就与草原植物群落构成一个完美协调的生态系统。我们设想,核心保护带内有 3 种情况:第一,严格不动的核心"观测区"面积很小,目的只是观测没有动物干扰下的植物群落的动态与过程。第二,核心区可以放牧,可以割草,但要严格管理,科学规划,实现草畜平衡,实现天然草原的可持续发展,而其面积大小,作为第一步和起始阶段,可以海流特典型草原与查干敖包草甸草原约 300 km^2(约为保护区总面积的 3%)为限,严格按法办事,摸索经验,总结规律,一旦成熟可再逐步扩大。第三,建立生产示范区,由牧民直接参与科学规划生产示范区。

② 突出草原特色,重点管理好海流特平原及其周边地区。本保护区的特色是草原,首先是典型草原与草甸草原,最有代表性的当是海流特平原及查干敖包。要下大力气保护好、管理好这一片草原。主要由于交通不便,这一地区目前保存较好,千万不能再由于我们管理不好而退化。目前影响其管理的是不断增加的牧户与开垦。生态移民,首先要把这一范围内的牧民移出;要禁止增加新的耕地,现有耕地要逐步压缩、退耕还草、自然恢复。

③ 申请加入国家生态功能区。国家正在启动生态功能区计划,锡林郭勒草原作为京津地区的重要生态屏障,对于保障京津地区的生态安全,具有重要作用与地位。近几年愈来愈严重的沙尘暴与锡林郭勒保护区及其邻近地区草地植被的破坏关系十分密切。从根本上治理这一地区草地生态系统的退化,争取国家更多的关注与支持十分重要。因此,我们认为,从更高的层次上提升保护区在国家层面上功能的认识具有十分重要意义。关于如何申请,如何规划,又如何管理,都还值得研究。不过,国家环保局正在考虑与规划国家生态功能区,我们宜抓紧进行。

1.6 建议

就上述涉及的几个问题,提出如下建议:

(1) 积极协调各方力量,争取与中央有关单位合作,在锡林郭勒盟政府领导下,申请国家生态功能区,以争取更多支持与更广泛关注。

(2) 扩大核心区,设立核心保护带。

(3) 突出海流特及其周边地区,做好其境内的生态移民与安置。

(4) 与草原站、畜牧局合作,在盟政府的领导下,制定退化草原生态系统分类治理技术措施——围封、禁牧,还草原于牧民,压缩牲畜头数,建立人工草地,舍饲半舍饲等。

第2章

锡林郭勒生物圈保护区草原植被退化的现状与成因

2.1 前言

内蒙古锡林郭勒生物圈保护区是中国温带草原第一个生物圈保护区，建立于1985年。该保护区以内蒙古锡林郭勒河流域自然分水岭为界，面积约为10 786 km^2。在保护区建立伊始，该区域是中国北方基本上还保留完整的一个温带草原景观区域，在内蒙古高原草原区具有很好的典型性和代表性。建国以来，该区域也一直是中国北方重要的畜牧业基地之一。应该说，锡林郭勒草原生物圈自然保护区的性质是：在合理开发利用草地资源的基础上，保持保护区内温带草原生态系统结构与功能的多样性与完整性。该自然保护区肩负着草原生态系统保护与区域畜牧业持续发展的双重任务，是一个以自然资源管理为主的具有综合功能的生物圈保护区。

锡林郭勒河是内蒙古境内一条重要的内陆河流，位于内蒙古高原东部。锡林河流域东缘属于大兴安岭西麓低山丘陵区，海拔1 500 m左右。地势东南高西北低，至锡林河下游最低处为902 m，全流域相对高差达600 m。该流域地貌具有明显的分区性，锡林河以南为多级玄武岩台地，平坦开阔，锡林河中下游是以低山丘陵与高平原（塔拉）相间分布为特征的内蒙古高平原的一部分，上述两大地貌单元之间分布有小腾格里沙带的一部分。气候属于大陆性温带草原气候，冬季漫长。年平均降水量350 mm，从东南向西北，许多气候因子，包括温度和无霜期都在逐渐增多，而降水量却在逐渐减少，锡林浩特市年平均气温为2.0 ℃。植被类型从东南向西北依次分布有草甸草原、典型草原与干草原，土壤类型同样具有明显的地带性分布。

实践证明：自然保护区建立以后，能否真正发挥保护生物资源的功能，关键在于管理水平的高低，没有科学、有效的管理，自然保护区的建立就形同虚设。可以说，建立保护区容易，管理保护区难。

内蒙古锡林郭勒生物圈保护区建立的目的就是保护内蒙古高原最具代表性的草原生态系统。该保护区建区初期，共设计了5个核心区，它们分别是：① 查干敖包草甸草原核

心保护区，重点保护低山丘陵草甸草原生态系统；② 巴彦乌拉灰腾希勒草原核心区，重点保护玄武岩台地草原生态系统；③ 海流特平原典型草原核心区，重点保护典型草原生态系统；④ 陶乌音陶勒盖残遗白扦云杉林核心区，重点保护沙地云杉林团块；⑤ 阿布都尔山杨、白桦林核心区和森林草原景观。除了以上 5 个核心区外，在锡林郭勒草原生态系统自然保护区内还设置了 5 类科学实验生产示范区。第一类是放牧管理示范区，放牧利用是当前草原利用的主要方式，为此，在草原保护区内设置放牧利用试验区，目的是为了探讨如何做到提高草原生产力，科学养畜，促进草原畜牧业健康、持续的发展。第二类是割草试验区。割制干草是保证牲畜安全过冬的重要措施，也是本区草原利用的又一重要形式。近十几年来，许多地段由于连年的割草而明显退化。探讨如何在割草利用条件下保持草原生态系统平衡的途径，极为重要。第三类是人工草地试验区，在局部水热条件适宜的地段，建立人工草地是提高草原生产力，保护大面积草原免遭退化的有效途径，是实现畜牧业现代化的又一重要措施。第四类是退化草原改良试验区。第五类是草原生态系统的基础实验区。

为了实现这一双重目标，必然需要多种学科的相互交叉与配合才能达到目标。实际上，对于内蒙古锡林郭勒草原生物圈自然保护区范围内草原生态系统的研究，从 20 世纪 60 年代国家拟在该地区建立国家现代草原研究中心就已开始，到 1979 年中国科学院内蒙古草原生态系统定位站的建立，再到 1985 年内蒙古锡林郭勒草原自然保护区的正式成立与第一期规划的实施及 20 世纪 80 年代中后期开展的内蒙古草地资源遥感调查，已取得了不少的研究成果。但应该承认，对于核心区以外的广大缓冲区和正常生产作业区草原生态系统的管理与保护工作，在草原生态系统的首要功能是发展畜牧业的原则指导下，并没有认真加以落实。在放牧利用强度不断增大的形势下，锡林郭勒生物圈保护区内草原生态环境退化受损严重，包括草原植被退化、土地沙化、盐渍化与乱垦所造成的弃耕地，形势十分严重。

对于人类而言，草原是一类特定的土地资源，它既可用做放牧场或打草场，又可以作为人类的游憩地以及野生动植物栖息生长地，还可以作为某一区域的绿色生态保护屏障。草原退化问题的出现，是相对于其利用价值为评价标准而言的。在这方面，许多学者都曾给出定义，如“草地退化是指不合理的管理与超限度的利用以及不利的生态地理条件所造成的草地生产力衰退与环境恶化的过程”，或“由于人为活动或不利的自然因素所引起的草地(包括植物及土壤)质量衰退，生产力、经济潜力及服务功能降低，环境变劣以及生物多样性或复杂程度降低，恢复功能减弱或丧失恢复功能，即称之为草原退化”。草原植被退化是草原退化的主要表现之一。人类对于草原植被退化的研究分为小尺度定位研究与大尺度空间格局遥感研究。在内蒙古锡林河流域，中国科学院植物研究所与日本岐阜大学流域环境研究所合作开展了土地退化遥感监测研究，在以居民点为中心的草原退化空间特征遥感分析方面已取得了进展，但其研究较多集中在锡林河流域中上游地区。锡林郭勒生物圈保护区草原退化大尺度空间格局的分析研究，必将为该保护区草原生态系统科学、合理的管理提供决策支持。

2.2 草原退化大尺度研究途径

在土地荒漠化及植被退化大尺度监测中，遥感信息、地理信息系统和地面调查相结合的方法是主要的途径，草原退化大尺度研究同样如此。在地面路线植被调查的基础上，通过对锡林郭勒生物圈保护区不同时期的卫星遥感影像的目视解译，编制出 1985 年和 1999 年锡林郭勒生物圈保护区植被类型图，在此基础上，衍生出草原退化图。

一般对于区域层次草原退化宏观遥感监测结果与空间格局的表征，先给出草原退化总面积，再给出不同退化等级的草原面积。在目前构造可持续发展指标体系或环境指标体系工作中，环境指标的整合(aggregation)及各种环境指数的构造应该说是一个重要的趋势，即最好用最少的指标(如一个指数)对某一个环境问题加以表征，以减少整个指标体系所包含的指标数目。依据笔者构造的一个将退化面积信息与退化等级信息整合的草原退化指数，计算了锡林郭勒生物圈保护区内草原退化指数值。

2.2.1 典型草原退化演替系列及草原退化图的编制

在草原退化大尺度空间格局研究中，利用草原退化演替系列诊断模式，在绘制出草原植被类型图的基础上，衍生出草原植被退化现状图，是一可用的方法。

利用锡林河流域 1999 年 1∶250 000TM 假彩色合成影像和 1985 年 1∶300 000TM 假彩色合成影像，结合地面植被调查，同时参考锡林郭勒自然保护区区划图和内蒙古自治区 1∶1 500 000 植被类型图说明，编制出锡林郭勒生物圈保护区植被类型分布图。在该植被类型图中，草原植被共划分出 18 个群落类型。将植被类型图数字化，在地理信息系统软件 ARC/INFO 和 ARC/VIEW 的支持下，根据锡林郭勒生物圈保护区内主要草原植被类型大针茅(*Stipa grandis*)＋羊草(*Leymus chinensis*)典型草原和克氏针茅(*Stipa krylovii*)荒漠草原退化演替系列模式，由植被类型图衍生成草原植被退化分布图。在强度放牧利用下，以上 2 个群落除了最终趋同于冷蒿(*Artemisia frigida*)占优势的重度退化类型外，在不少过牧地段还趋同于糙隐子草(*Cleistogenes squarosa*)占优势的重度退化类型。在居民点附近局部地段还出现一定面积的星毛委陵菜(*Potenllia acaulis*)，或阿氏旋花(*Convolvulus ammannii*))占优势的退化类型，但面积较小，无法在 1∶250 000T M 卫星影像上判读。小叶锦鸡儿(*Caragana microphylla*)灌丛化日益增多也是锡林郭勒生物圈保护区草原退化的一大景观标志，但很难直接从遥感影像判读，在植被图的绘制时，结合地面群落样方调查，勾画出小叶锦鸡儿灌丛化类型图斑边界。我们将小叶锦鸡儿灌丛化十分明显的大针茅＋糙隐子草＋冷蒿草原划为中度退化类型，将小叶锦鸡儿灌丛化的糙隐子草＋冷蒿草原划为重度退化类型。

草原退化的范围很广，导致草原退化的原因也各不相同，制订统一的退化指标体系是很困难的。李博认为对于因放牧和割草等活动引起的草原退化，可以从植物种类组成、地上生物量与盖度、地被物与地表状况、土壤状况、系统结构和可恢复程度 6 个方面去划分退化等级；刘钟龄认为应从植物群落生物量下降率、优势植物种群衰减率、退化演替指示

植物增长率、植丛高度下降率、植物群落盖度下降率、轻度土壤侵蚀度、中重质土壤容重硬度增高及可逆性和恢复年限9个方面划分草地退化等级。刘钟龄、李博将草原植被退化划分为4个等级，即轻度、中度、强度(重度)、严重(极度)退化，为了易于对植被类型图上的群落类型进行退化等级的划分，同时也是为了易于构造以下的草原退化指数，将强度与严重退化合为一级，仅划分3个等级，即放牧轻度退化、放牧中度退化与放牧重度退化3级。对于锡林郭勒生物圈保护区内的沙地植被、耕地、撂荒地与低湿地草甸植被，城镇和水体单独给出图例，其中撂荒地也看做为因草原垦殖所形成的草原植被退化类型。

2.2.2 地貌类型图的编制与数字化

利用锡林郭勒生物圈保护区1：250 000地形图与1：250 000T M假彩色合成影像，编制出锡林郭勒生物圈保护区地貌类型图。将该地貌类型图数字化，在地理信息系统软件ARC/INFO的支持下，与锡林郭勒生物圈保护区草原植被退化分布图相叠加，可计算不同地貌类型上的不同草原退化等级的面积。

2.2.3 草原退化指数的构造

草原退化指数构造的目的是将草原退化的面积信息与退化等级信息相整合。在草原退化判别指标中，植物群落地上生物量下降率是最重要和显而易见的一个指标。对于刘钟龄、李博划分的4个等级草原退化等级，即轻度、中度、强度(重度)、严重(极度)退化，他们给出的植物群落地上生物量下降率分级标准分别是：轻度退化：20%～35%；中度退化：36%～60%；强度(重度)退化：61%～90%(61%～85%)；严重(极度)退化：>80%(>85%)。为了便于构造草原退化指数，将轻度、中度和重度3个退化等级类型的植物群落地上生物量下降率各自确定为一个平均值，即轻度退化：1/3；中度退化：1/2；重度退化：2/3。这样以不同退化等级草原地上生物量下降的比例为权重因子，将各退化等级的草原面积相加，便构成了草原退化指数。计算时，将地上可食生物量下降1/3的单位面积的轻度退化草原定值为1，记为一个草原退化单位(GDU)，则单位面积的中度退化草原为1.5个GDU，单位面积的重度退化草原为2个GDU。具体计算公式为

$$GDI = \sum_{i=1}^{3} W_i \cdot S_i$$

式中：GDI——草原退化指数；

$i=1,2,3$——分别代表轻度、中度和重度退化草原；

W_i——i 级退化草原退化权重因子值，轻度为1，中度为1.5，重度为2；

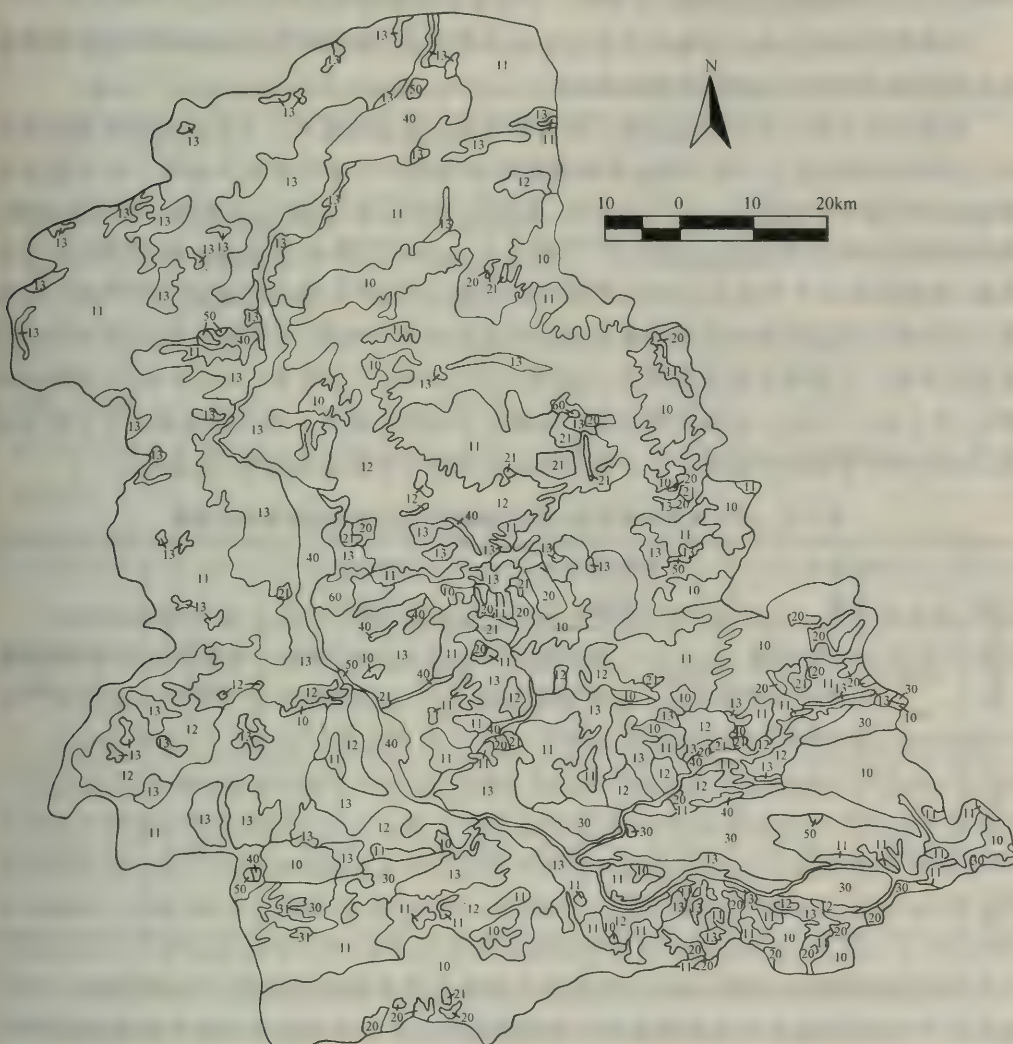
S_i——i 级退化草原面积；

草原退化指数单位：单位面积草原退化单位(GDU)。

2.3 草原退化现状

锡林郭勒生物圈保护区草原退化情况见图2-1。由图2-1计算得出：1999年锡林郭勒生物圈保护区总的草原退化(这里包括放牧退化和割草退化)面积为7 689.3km^2，占总

流域面积的 71.86%，占保护区内草原总面积的 81.70%。其中轻度退化草原面积为 3 678.8km²，占总流域面积的 34.38%，占保护区内草原总面积的 39.08%；中度退化面积为 1 933.6 km²，占总流域面积的 18.07%，占保护区内草原总面积的 20.54%；重度退化



图例

一、草原放牧退化
10　未退化草原
11　轻度退化
12　中度退化
13　重度退化

二、草原开垦与撂荒
20　耕地
21　撂荒地

三、草原区沙地
30　固定、半固定沙地
31　流动沙地

四、低湿地草甸
40　草甸

五、水体
50　水体

六、城镇
60　城镇

图 2-1　1999 年锡林郭勒生物圈保护区草原退化图（1∶1 600 000）

面积为 2 077.2 km^2，占总流域面积的 19.41%，占保护区内草原总面积的 22.07%。另外，草原垦殖撂荒地面积为 84.30km^2，占总流域面积的 0.79%，流动沙地面积 17.57 km^2，占总流域面积的 0.16%。1999 年锡林郭勒生物圈保护区未退化草原面积为 1 722.77km^2，占流域总面积的 16.10%，占保护区草原面积的 18.30%。

将草原垦殖撂荒地也看做草原重度退化受损类型，锡林郭勒生物圈保护区总的草原退化指数为 10 901.8km^2草原退化单位。

锡林河是内蒙古锡林郭勒草原一条内陆河流。锡林河流域上中下游草原植被类型不同，人类利用的强度也不同，因此，草原退化的程度在中下游反映有所差异。关于锡林河流域上中下游在空间范围上的具体划分，还未见文献报道，根据河流流域一般划分原则，综合参照锡林河流域地形、地貌特点、土壤分区、3 个年均降水量带的空间划分以及草甸草原、典型草原与干草原 3 个草原亚带的空间划分，划分出锡林河流域上中下游空间范围。上中游主要以锡林河上游主要支流好来吐河为划分界限，中下游主要以巴日钦乌拉为划分界限。上游和下游面积较小，上游为 2 659.4 km^2，下游为 2 217.3 km^2，中游面积较大，为 5 816.6 km^2。在锡林河流域草原退化分布图上叠加上锡林河流域上中下游分区图，得到 1999 年锡林河流域上中下游草原退化面积与草原退化指数，见表 2-1。

表 2-1 1999 年锡林河流域上中下游草原退化面积与草原退化指数

锡林河流域	轻度退化草原		中度退化草原		重度退化草原		草原退化指数	单位面积草原退化指数
	面积/km^2	占上游面积的百分比/%	面积/km^2	占中游面积的百分比/%	面积/km^2	占下游面积的百分比/%		
上游	352.5	13.25	288.7	10.88	246.1	9.25	1 277.7	0.48
中游	1 755.3	30.17	630.3	28.03	1 409.6	24.23	7 020.0	1.21
下游	1 570.8	70.84	18.5	0.83	421.5	19.01	2 441.6	1.10

同时，锡林郭勒生物圈保护区草原退化的程度在不同地貌类型中也有反映。表 2-2 给出了 1999 年锡林郭勒生物圈保护区内四种地貌类型上草原退化面积与草原退化指数。

从表 2-1 可见，在锡林郭勒生物圈保护区上中下游单位面积草原退化指数的排列顺序为：中游＞下游＞上游。由表 2-2 可见，在四种地貌类型草原退化指数的排列顺序为：高平原＞丘陵＞熔岩台地＞低山。同时，单位面积草原退化指数的排列顺序也为：高平原＞丘陵＞熔岩台地＞低山，其中高平原（塔拉）区的单位面积草原退化指数值为 1.29，是低山区的 4.16 倍，熔岩台地的 1.65 倍，平原区与丘陵区单位面积草原退化指数值十分接近。

锡林郭勒生物圈保护区草原植被退化空间格局较为复杂，不像该区域许多水热因子及生物多样性那样从东南向西北呈规律性变化。在草原植被退化大尺度空间格局上，首先流域中下游草原植被退化较为明显，其次，在全流域有多个草原植被退化较为严重的分布中心。其中，锡林河中下游两岸河谷阶地、毛登塔拉、海流特塔拉、锡尔塔拉、贡塔拉等

区段的草原植被退化受损最为严重。而在锡林河流域上游的低山丘陵区及锡林河南岸的灰腾梁三级熔岩台地上，草原植被，主要是草甸草原植被，呈未退化状态与退化较轻。这显然与人类的放牧利用强度有关，在海拔较高、牲畜饮水条件差的熔岩台与低山区，居民点少，放牧强度低，因此，原生草原植被保存较好。而在河谷阶地与平原丘陵区，居民点较为密集，放牧强度大，草原植被退化较为明显。

表 2-2　1999 年锡林郭勒生物圈保护区四种地貌类型草原退化面积与草原退化指数

地貌类型	轻度退化草原		中度退化草原		重度退化草原		草原退化指数	单位面积草原退化指数
	面积/km^2	占各地貌类型面积百分比/%	面积/km^2	占各地貌类型面积百分比/%	面积/km^2	占各地貌类型面积百分比/%		
低山	53.0	6.21	141.8	16.63	0.1	0.01	265.9	0.31
丘陵	1 064.9	46.56	395.2	17.28	519.1	22.69	2 695.9	1.18
熔岩台地	713.5	44.06	139.0	8.58	167.5	10.34	1 257.0	0.78
高平原	1 818.0	36.56	1253.0	25.20	1368.3	27.52	6 434.1	1.29

从遥感影像上看，在沿河两岸，草原退化呈宽度不等的带状分布。在毛登塔拉、海流特塔拉，以居民点为中心的草原植被退化呈斑块或斑点状分布，星罗棋布且界线十分清晰。而在锡林河流域中下游西北侧，严重退化草原则呈一定面积的均匀分布。

在空间分布上，不论是从遥感影像上分析，还是从所绘制的草原植被退化现状图都可以看出：在锡林郭勒生物圈保护区目前已形成多个草原植被退化受损集中分布区，其中退化受损严重的草原植被多分布在丘陵、平原（塔拉）及河谷阶地，熔岩台地与低山上植被退化受损较轻。这点从不同地貌类型单位面积草原退化指数值的大小比较也可看出，高平原为 1:29，丘陵为 1.18，熔岩台地为 0.78，低山为 0.31。另外，在更大尺度上，由于锡林河流域上中下游植被类型不同，更重要的是人类放牧利用强度的不同，造成了上中下游草原退化状况的差异。上游草原退化明显地较中下游轻，上中下游单位面积草原退化指数的排列顺序为：中游＞下游＞上游 。作为我国北方草原带的典型区段，昔日水草丰美的锡林郭勒生物圈保护区草原的大面积退化问题已经到了必须解决的时刻，否则当代人不会宽恕我们，后代人更不会原谅我们。因此，关于草原生态系统功能重新定位的问题也就必然摆在我们面前，是将绿色生态屏障功能放在首位，还是继续以畜牧业为主，是一值得深入思考的问题。

2.4　草原退化动态分析

自 1985 年锡林郭勒生物圈保护区建立到 1999 年 15 年间，保护区内草原退化呈逐步扩大的态势，表 2-3 给出了 1985 年和 1999 年锡林郭勒生物圈保护区草原退化的动态比较。

表 2-3 1985 年和 1999 年锡林郭勒生物圈保护区草原退化比较

	轻度退化		中度退化		重度退化	
	面积/km^2	占草原面积百分比/%	面积/km^2	占草原面积百分比/%	面积/km^2	占草原面积百分比/%
1985 年	4377.6	46.41	1399.1	14.83	1414.2	14.99
1999 年	3678.8	39.08	1933.6	20.54	2077.2	22.07

从表 2-3 可见，1985 年锡林郭勒生物圈保护区草原退化总面积为 7 190.9km^2，而 1999 年达到 7 689.6km^2，增加了 6.94%。虽然退化的面积增加的比例不大，但在这 15 年内草原退化的程度却在增加。轻度退化草原的面积由 1985 年的 4 377.6 km^2减少到 1999 年的 3 678.8 km^2，减少了 15.96%，而中度退化草原的面积由 1985 年的 1 399.1 km^2增加到 1999 年的 1 933.6 km^2，增加了 38.20%，重度退化草原的面积由 1985 年的 1 414.2 km^2增加到 1999 年的 2 077.2 km^2，增加了 46.88%。

2.5 草原退化成因分析

在过去的近 20 年里，锡林郭勒生物圈保护区草原植被退化呈现较明显增加的态势，究其原因，可能是多方面的。但是，人口的快速增长、居民点的增多、牲畜头数的不断增加、草原管理诸多方面的不合理，再加上近 3 年的连续自然干旱，都是造成该区域草原大面积退化的主要因素。

2.5.1 人口压力的不断增加

在 1989 年—1999 年 10 年中，锡林郭勒生物圈保护区主要隶属的锡林浩特市人口数从 11.67 万人增加到 13.69 万人，增加了 17.31%。例如锡林郭勒生物圈保护区西南部，原本是人口稀少的区域。在该区域内的灰腾梁三级熔岩台地上，由于缺水，人口稀少，一般不作为放牧场，因而这里的草原植被，主要是草甸草原植被，原本保存得非常完好。但是，近年来，由于该区域人口明显的增加，居民点随处可见。外来人口，特别是临近农区人口迁移到此，使得灰腾梁 3 级熔岩台地上的草甸草原也呈现明显轻度退化特征。在 10 年前，小叶锦鸡儿灌丛在植物群落中很少见到，但如今该区域局部地段已呈现出一定的小叶锦鸡儿灌丛化特征。

2.5.2 牲畜头数迅速增长

随着畜牧业的不断发展，锡林郭勒生物圈保护区内主要隶属的锡林浩特市主要牲畜种类羊的年末头数从 1989 年的 61.84 万只增加到 1999 年的 113.34 万只，增加了 83.28%，这说明人类活动对于该草原生态系统保护区的压力越来越大，再加上从 1999 年—2001 年连续 3 年自然干旱，锡林郭勒生物圈保护区草原生态系统退化的态势已到了

很严重地步。

2.5.3 草原管理的不合理

草原管理的不合理包括多方面，如：牲畜一年四季都在草原上放牧，草原几乎没有一段休养生息的空间，没有认识到人工草地的重要性，人工草地面积很小，季节性畜牧业的优势没有得到发挥等，都是造成该地区草原大面积退化的原因。

2.5.4 草原生态系统主要功能的定位问题

锡林河流域草原生态系统退化严重态势的形成与人们过去对于位于我国北方大面积的草原生态系统功能定位密切相关。在人们以往的认识中，草原生态系统绝对第一位的功能就是重要的畜牧业基地，在这种理念的支配下，人们无节制地向草原生态系统索取大量的畜产品，而没有真正科学、合理地估算草原生态系统的承载能力，也没有向草原生态系统输入必要的补充营养物质，其必然的后果就是草原生态系统的大面积退化。内蒙古锡林河流域草原大面积退化就是一例。因此，对于我国北方草原生态系统主要功能的重新定位是摆在科学家、管理者及政府决策者面前的一项紧迫而棘手的任务。能否将我国北方草原生态系统的主要功能定位在它是我国北方一条重要的绿色生态屏障，其次才是一个重要的畜牧业基地这一新的认识上来，并以此指导实践，也许是关系到内蒙古草原生态系统的未来与希望的一个至关重要的问题。

第3章

锡林郭勒生物圈保护区内草地畜牧业经营现状分析

锡林郭勒生物圈保护区的天然植被类型以草原为主体，这里既有世界上最华丽的草原类型——草甸草原，也有最具代表性的典型草原，还有向荒漠过渡的荒漠草原；同时，还有沙地疏林、灌丛、河漫滩草甸、沼泽，形成有规律的结合格局，构成丰富的草场资源，为发展畜牧业创造了优越条件。生活在草原上的蒙古族人民长期以来都将畜牧业作为其主要经济支柱。

但是在过去的几年中锡林郭勒的草场面临着严重的退化，我们再难以看到诗词中那种“风吹草低见牛羊”的迷人画面。如今的锡林郭勒大草原，在很多地区，即使是在牧草最茂盛的7月和8月，草的高度也仅有10cm左右，甚至还可以见到部分裸露的地面。究其原因，这种恶果的形成应该说既有天灾成分也有人祸因素。一方面是因为这几年旱情严重，缺水自然不利于草的生长；不仅如此，旱灾往往还可能诱发蝗灾，更进一步妨碍了草场的恢复。另一方面，由于草场都已承包到户，牧民在经济利益的驱使下，过度放牧，牲畜数量在过去40年里增长了3倍～4倍，大大地超过了草场的承载力。在这里我们不是要追究谁的责任，但我们目的非常明确，就是要尽快地恢复草场，保护好锡林郭勒大草原的生态环境。实践表明，在目前畜牧业经营“靠天吃饭”的情况下，单纯依靠牲畜量增加的畜牧业并不是一种可持续的经济发展之路。要真正使牧民生活水平不断地稳步提高，草原的产业结构亟待调整。

通过对2000年牧业年度锡林郭勒保护区范围内的白音锡勒牧场进行畜牧业成本收益分析和对牧户进行财务分析以及对白音锡勒牧场经济收入的分配体制的分析，找出目前锡林郭勒牧业发展存在的问题、原因及其与目前草原生态环境退化的关系，目的是在此基础上分析产业结构调整的紧迫性以及将生态旅游作为支柱产业之一的必要性。

3.1 保护区畜牧业经营现状

由于白音锡勒牧场的典型性，我们以其为例从两个角度分析保护区畜牧业经营现状：一是从宏观角度，即对白音锡勒牧场畜牧业经营进行经济分析，加入环境成本因素，计算

畜牧业对锡林郭勒草原的真实的经济贡献；二是从微观的角度，从牧场内居住的牧户中选择一户人家，从经营角度对其进行财务分析，计算牧民畜牧业净收入。

3.1.1 相关的经济学方法

宏观部分采用经济分析方法，微观部分采用财务分析方法，详见表 3-1。

表 3-1　财务分析与经济分析的比较

比较内容	财务分析	经济分析
出发点	从牧户经营角度出发，反映利润或亏损	从牧场社会福利着眼，反映社会机会成本或效益
取值	牧户个人的净利润	社会净利润
目的	指明牧户从事畜牧业经营活动的动因	旨在确定畜牧业的实际成本和效益，根据经济效益确定是否投资
税收	牧户的生产成本，上交当地税收部门	社会总效益的一部分
贷款	增加资本量	转移支付，根据要求转移资源
利息	财务成本，增加成本量	转移支付，根据要求转移资源
收入分配	通过各种生产要素的净利润加以衡量	在经济效益分析中不予考虑，可分别加以分析

白音锡勒农牧场系统统计年报 2001

由表 3-1 可知，经济分析即效益－费用分析的公式为：

社会净利润＝(畜牧业直接收益＋外部或环境收益)－(畜牧业直接成本＋环境成本)；

而财务分析是针对牧户个体所做的利润分析，公式为：

牧户净利润＝总收入－总成本。

目前，由于各种各样人为和自然原因，更重要的是现有经济发展模式的不合理性，造成锡林郭勒草原生态环境严重退化。环境退化已越来越制约保护区的经济发展，一旦环境严重破坏，基本的生存条件无法满足，更不可能找到可以替代的产业发展经济。例如，土地退化意味着作为饲料的生产物质的减少，土壤质量降低会导致粮食产量的下降，灾害性天气的加剧和频繁发生会危及人民的身体健康和生活生产。由此可见，环境对于经济以及所有人的福利都是非常重要的，忽视环境损害会威胁到我们对发展所做的长久努力。为此，在本研究中我们将环境成本加入牧场经济核算体系中，揭示其现有经济发展模式的不可持续性，并通过对产业结构的调整，减轻经济发展对环境的压力。

环境成本是指商品在生产和消费过程中造成环境污染、资源退化而产生的成本。联合国统计署在 1993 年发布的“环境与经济综合核算体系”中，把环境成本界定为：① 因自然资源数量消耗和质量减退而造成的经济损失；② 环保方面的实际支出，即为了防止环境污染而发生的各种费用和为了改善环境、恢复自然资源的数量或质量而发生的各种支出。到目前为止，锡林郭勒生物圈保护区内与畜牧业有关的环境成本主要是第一种即灾害造成的可计量的损失，包括雪灾、沙尘暴、蝗灾 3 部分，而第二种环境成本即与畜牧业有

关的环保方面的实际支出几乎为零。所以我们只计算第一种环境成本。

在微观经济学的水平上,目前常用货币化技术来分析经济活动引起的环境损害或环境收益,从而进行费用一效益分析。这些货币化技术分为3类方法:第一类是采用替代市场的方式,例如,通过空气污染对资产价值的影响来对空气污染影响的价值进行估价,通过旅行费用考察分析自然资源的游憩价值等;第二类是通过调查、提问等方式来建立一个市场,以决定人们对环境支付的意愿,这种直接询问的方法特别适用于为野生动物和濒危物种定价;第三类是通过物理的剂量反应关系来定价,例如,先确定空气污染同人体健康的关系,然后通过市场价格或其他方式来对这种影响进行定价。我们主要采取第一类方法。对资源退化和环境经济损失即成本的评估在发展中国家还处于初始阶段,目前较多地应用在水土流失、过度砍伐等环境问题的损失评估中。尽管数据质量及得到的结果不是很确定,但其分析结果还是能相对说明环境恶化对经济造成的损失(Pearce & Warford 1996)。

我们将经济分析的时间范围划定在2000年6月30日至2001年6月30日(在文中将其定义为2000年牧业年度),根据实际发生的可量化的收入和支出值计算这一牧业年度畜牧业的社会净利润。财务分析与经济分析的价格以2000年价格为准。

3.1.2 对白音锡勒牧场畜牧业经营的宏观经济分析

锡林郭勒生物圈保护区主要包括4个牧场(白音锡勒、毛登、贝力克、白音库伦)和锡林浩特市。由于白音锡勒牧场在保护区中的重要性及典型性,我们将以之为对象,根据上述社会净利润的计算公式,通过计算白音锡勒牧场的年总收入(包括畜牧业直接收益和外部或环境收益)以及所需的畜牧业直接成本,并将全盟范围或保护区范围尺度的环境成本按下面的计算比例折算到白音锡勒牧场尺度范围内,分析白音锡勒牧场目前真实的畜牧业经济收益。

白音锡勒牧场创建于1950年,是全国农垦系统规模最大的牧业生产单位之一。草地资源以典型草原与草甸草原为主,拥有天然草场面积3 317.47 km^2,草场有效利用面积3 058.33 km^2,占整个保护区草场面积的1/3,据估计,其畜牧业产值占保护区畜牧业产值的1/3。根据2000年末牲畜数量所占比例,白音锡勒牧场畜牧业产值占锡林郭勒盟畜牧业产值的2.1%(211 344只 / 10 180 183只)。由于环境成本项目无法得到牧场尺度范围的准确值,所以需要根据以上比例推算,最后得出白音锡勒牧场畜牧业的社会净利润值,见表3-2。

白音锡勒牧场内畜牧业的收入结构及成本结构,分别见图3-1和图3-2。图3-1显示,该地畜牧业的主要收入来源是直接出售畜产品,占总收入的96%;畜产品加工及卖给游客的肉制品和奶制品只占很小比例,各占2%。可见,牧场经济基本处于以出卖初级产品为主要经济来源的发展阶段,而能带来高额利润的产品深加工则几乎没有。从图3-2中可以看出,环境成本中单是灾害造成的可计量的损失就占总成本的27%(包括雪灾引起的环境损失15%、沙尘暴9%、蝗灾3%)。如果不计环境成本,牧场2000年净收益为2 231.89万元,如果将环境成本计算入内,则该地区的真实收益只有1 550.90万元,仅为

传统净收益核算值(2 231.89 万元)的 69%。显然,如果按照绿色经济核算方法,即在计算净收益时考虑环境成本,则牧场 2000 年真实净收益将减少近 1/3。

表 3-2　白音锡勒牧场畜牧业收入及成本的经济分析　单位:万元

收入	畜产品直接收入:3961.99 畜产品加工收入:71.50 畜牧业带动的旅游业收入:83.20 总计:4116.69	
成本	生产成本	建设牲畜饲养设施、购买生产资料等的费用:1884.80
	环境成本	雪灾:140.18(牲畜损失:死亡 2 万头只)+239.02(抗灾投入) 沙尘暴:42.33(财产保险)+8.46(医疗费用)+171(治沙费) 蝗灾:80 环境成本小计:680.99
	总计:2565.79	
纯收入	1550.90	

注:①畜产品直接收入:包括出售牛肉、羊肉等畜产品的收入;

② 畜产品加工收入:指出售加工后的初级畜产品所得的收入;

③ 畜牧业带动的旅游业收入:指旅游经营者出售手扒羊肉等肉制品和奶制品所得收入;

④ 畜牧业生产成本:指建设牲畜饲养设施、购买生产资料等的费用;

⑤ 环境成本:指畜牧业商品在生产和消费过程中造成环境污染、资源退化而产生的成本,在此处指灾害造成的可计量的损失,包括雪灾、沙尘暴、蝗灾三部分。

现在对于环境损害成本的估算还处于幼年期,污染损害一般占工业化国家 GNP 的 1%~5%,由于缺乏环境立法和专门机构,发展中国家的环境损害可能要比工业化国家高一些。一些国家的估算表明:发展中国家的环境损害成本大约占其 GNP 的 5%(Pearce 1996)。而白音锡勒牧场畜牧业环境成本占其总收入的 17%(680.99 元 / 4 116.69 元),远远高于 5%的平均水平。显然,环境损失对当地畜牧业经营已经造成很大的影响,且已经严重制约该地区经济的发展。当地政府应从宏观角度考虑,改变目前的畜牧业经营方式,并寻找新的经济发展出路以替代目前的单一畜牧业经济结构。在发展的同时恢复和

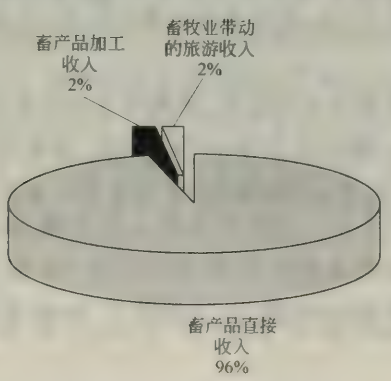


图 3-1　白音锡勒牧场 2000 年牧业年度畜牧业收入构成

保护现有草场资源，才能保证当地居民健康、富裕的生活，达到可持续发展的目标。

必须指出的是，本文中的环境成本仅包含了可计量的那部分环境损失；对于自然资源的生物多样性价值、存在价值等，由于量化计算的困难，在此并没有予以考虑。因此，本文的环境损失只是真实的环境损失值的一部分。

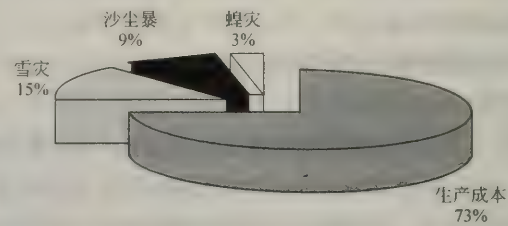


图 3-2 白音锡勒牧场 2000 年牧业年度畜牧业成本构成

3.1.3 对牧户的微观财务分析

白音锡勒牧场分为总场和 12 个分场，其中第七分场占地 500 km^2，有 275 户牧民，共 1 029 人，分场在 2001 年 6 月有 84 700 个羊单位(1 只大畜＝6 个羊单位)。据调查，近几年，牧民人数不断增加，尤其是流动人口的增加，直到 1997 年—1998 年人口分布形成，人口密度也得到了控制，但以前无人居住的无水草场上，现在也有牧民拉水养畜。

在第七分场的 275 户牧民中，经济水平较高的牧户即“大户”约有 30 多户，每户平均占有 400 只羊，300 只羊羔，20 头牛，相当于 820 个羊单位，年收入可达 5 万元以上。经济水平最差的有 22 户，他们没有牲畜，靠打工赚得每月约 300 元左右的收入。有 150 户牧民拥有牲畜低于 100 只，仅可以维持生活，一旦遇到天灾或疾病，就只能负债维持。

由于 2000 年夏季干旱，草场产草量少，冬季又发生特大雪灾，大雪将本来就不高的枯草埋得很深，根本无法放牧，所以去年牲畜舍饲半年，第七分场 70％的草是从外地购买的。每只羊平均每天花费 0.70 元，每只羊共花费 130 元，大多数牧民几乎花光了前两年的积蓄。

某牧户，7 口人，分得打草场 1 200 亩，放牧场 4 400 亩，饲养 500 只羊，11 头牛(自给)，经济水平属中等偏上。据户主介绍，1998 年前，每年可打草 20 万斤，还可以卖草赚得收入，在 1996 年—1998 年，羊也最多，有 860 只。近几年草质退化严重，1996 年比 1984 年的产草量减少了一半。该牧户去年入冬时剩 440 只小畜，在 2000 年 12 月 31 日到 2001 年 1 月 1 日的雪尘暴中有 20 多只山羊、10 多只绵羊和 2 只牛死亡，加上正常死亡，过冬后小畜仅剩 380 只，表 3-3 为该牧户 2000 年 6 月至 2001 年 6 月畜牧业经营情况。

表 3-3　保护区内某牧户 2000 年度财务分析　单位:元

收入	出售羊只:40 000
支出	买草料:7 400(包含运费 1 700) 雇人打草:5 600(包含运费 2 000) 草场费(交分场):504 税费(每年 7 月交):10 840 灾害损失:8 850 总计:33 194
纯收入	6 806

注:对于灾害损失一项,采用了如下计算方法:该牧户去年入冬时剩 440 只小畜,在 2000 年 12 月 31 日到 2001 年 1 月 1 日的雪尘暴中有 20 多只山羊、10 多只绵羊和 2 只牛死亡,加上正常死亡,过冬后小畜仅剩 380 只。按正常死亡率为 3%计算,其中 13 只羊属正常死亡。灾害损失计算如下:

150 元 /只×(60 只−13 只)+ 150 元 /只× 2 头× 6 =8 850 元

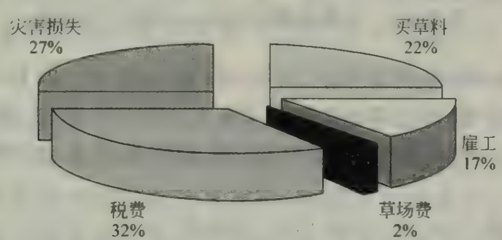


图 3-3　某牧户 2000 牧业年度生产支出构成

由表 3-3 可见,根据财务分析,这户牧民在 2000 年 6 月到 2001 年 6 月畜牧业经营收入为 6 806 元,人均 972 元(6 806 元 / 7 人)。这样一个 7 口之家,有 2 个孩子在锡林浩特市上学,每年除基本生活生产费用外,还需负担 1 万多元的学费和生活费。这意味着该牧户为了维持生产和生活,必须花费原有的储蓄。据走访牧户调查,连续 3 年的灾害,使得大多数牧民已经花光了原有的积蓄。图 3-3 为该牧户的支出构成,从图中可知,灾害损失占总支出的 27%,反映了环境退化所带来的自然灾害对牧民经济收入造成巨大影响;由于草场退化而不得不买草来维持牲畜养殖的支出为 22%,这也是由于环境退化而带来的损失。从对该牧户的财务分析可以看出,由于环境退化而带来的损失占总支出的近一半,为 49%(灾害损失和买草料)。我们可以由此得出以下结论:① 现在锡林郭勒草原的退化及灾害已直接导致牧民畜牧业经营的亏损,如果草场生产力不能得到恢复,自然灾害持续到明年,畜牧业经营和牧民生活将无法维持;② 在目前草原牧区畜牧业经营对自然条件依赖性很强的条件下,仅依靠单一的畜牧业,经济结构非常脆弱,长此以往,牧民收入根本无法保证。

3.2　各利益相关者在畜牧业中的经济获益程度分析

为了分析畜牧业对所有利益相关者在经济上的贡献,下面分析白音锡勒牧场通过畜牧业经营使地方政府、牧场、牧民以及其他利益相关人员获益的程度。

根据上述对白音锡勒牧场畜牧业经营的经济分析，白音锡勒牧场2000年牧业年度畜牧业经营的社会净利润是1 550.9万元，其分配结果如下：

(1) 国家和地方税收：269.3万元

(2) 牧场：卫生费、管理费等和草场费——662.9万元

公有畜收入——24.6万元

总计：687.5万元

(3) 牧民收入：牲畜收入——145.4万元

打工收入——222.0万元

总计：367.4万元

(4) 运输户收入——226.7万元

具体计算说明见专栏3-1。

专栏3-1　白音锡勒牧场收入分配计算说明

2000年牧业年度白音锡勒牧场共出卖大畜10 133头，小畜166 023只，按1只大畜 = 6个羊单位，折合成羊单位数是226 821只。其中公有畜：大畜2 318只，小畜25 206只，折合成羊单位数是39 114只，占总数的17%。2000年年末存栏数是大畜4 464头，小畜206 880只，折合成羊单位数是233 664只羊单位。

(1) 国家税收：按大畜20元/头，小畜15元/只收税，共269.3万元；

(20元/头×10 133头)+(15元/只×166 023只)= 269.3万元

(2) 牧场所得的卫生费和管理费：按大畜40元/头，小畜35元/只，共621.6万元；

(40元/头×10 133头)+(35元/只×166 023只)= 621.6万元

(3) 牧场所得的草场费：每亩草场的使用费是0.07元～0.09元，按0.09元/亩计算，牧场共有可用草场3058.33km^2，共可得41.3万元；

(0.09元/亩)×(3 058.33km^2× 1 500亩/km^2)= 41.3万元

(4) 运输户收入：由牧户财务分析可得，每只羊过冬要分摊9.7元的草料运费：

(1 700+2 000)元/380只 = 9.7元/只

则整个牧场年末存栏牲畜所花草料运费为：

(9.7元/只)×(4 464头×6只/头 + 206 880只)= 226.7万元；

(5) 牧民打工收入：由牧户财务分析可得，过冬的2.5×10^4 kg草料是雇人花了12天从个人分得的打草场打的，每天的花费是300元，所以每只羊分摊的打草费是9.5元：

(300元/天×12天)/380只 = 9.5元/只

则整个牧场年末存栏牲畜所花打草费为222.0万元；

(9.5元/只)×(4 464头 × 6只/头 + 206 880只)= 222.0万元

(6) 经营畜牧业收入：由畜牧业社会净利润减去以上内容，得经营畜牧业的净收入为170.0万元。

1 550.9万元－269.3万元－621.6万元－41.3万元－226.7万元－222.00万元 = 170.0万元

其中牧场公有畜收入按85%的比例提成：170×17%(公有畜所占比例)×85% = 24.6万元

牧民经营畜牧业净收入：170万元－24.6万元＝145.4万元

牧民人均收入：(145.4万元 + 222万元)/10210人 ＝359.8元/人

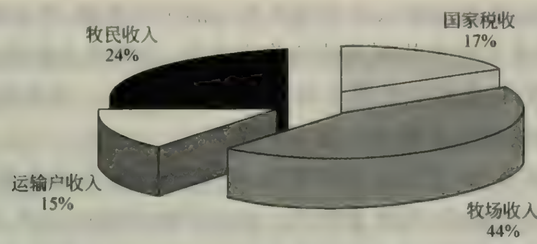


图 3-4　2000 年牧业年度白音锡勒牧场畜牧业社会净利润分配

注：这里牧民所得的牲畜收入为净收入，而打工和运输收入是其从畜牧业经营获得的社会净利润中分得的一部分收入，并没有减去其自身经营所花费的成本，如运输工具的购买维修、油料消耗和打工者的个人投入等。

由图 3-4 可知，在畜牧业社会净利润中牧场获得了其中的 44%，是最大的利润获得者；国家税收占 17%，居第二位；运输收入中有一部分为牧民所得；没有牲畜的牧民，其收入主要来自打工；而牲畜收入都为牧民所得，可见牧民分得的收入占 24%，牧场人均牲畜收入 359.8 元 /人(367.4 万元 / 10 210 人，没有计算运输收入)。在上面对牧户的微观财务分析中，牧民人均收入为 972 元 /人，两者比较，可见牧场人均畜牧业净收入更低。这一方面是由于此牧户经济水平中等偏上；另一方面由于牧户财务分析只计算了一部分环境成本，而治沙、灭蝗等费用则没有计算在内，从而使得两者存在差距。

如果减少牲畜数量以恢复保护草场，短期内必将引起畜牧业收入的减少。这样就需要用其他产业部分替代畜牧业以弥补降低的收入。下面我们分析短期内由于畜牧业收缩对各利益相关者的影响。

(1) 对国家和地方财政来讲，2000 年锡林浩特市地方财政收入是 16 766 万元，按照白音锡勒牧场畜牧业产值是保护区畜牧业产值的 1/3 来算，则保护区畜牧业对锡林浩特市地方财政的贡献是 5%((269.3×3)/ 16 766)。如果压缩畜牧业，对当地财政的影响不大。但从畜牧业的战略地位分析，会给当地经济带来两大影响：

① 据 1996 年统计，锡林郭勒盟牛肉产量占内蒙古自治区的 30%，羊肉产量占全自治区的 31.3%，占全国的 2.7%，细羊毛产量占全自治区的 24.5%，占全国的 7.0%，山羊绒产量占全自治区的 20.7%，占全国的 7.6%。牛羊肉、牛羊皮、羊毛、羊绒产量等十几项经济指标在全自治区名列第一(敖日布 1997)。如果压缩畜牧业，则全自治区乃至全国畜产品市场将会受到很大冲击，出现如价格上涨、投机倒把等现象。

② 牲畜数量减少会直接影响当地畜产品加工业，因此，如果把这种乘数效应考虑进来，当地财政收入受到影响的将不仅仅是 5%。同时伴随的失业问题也可能出现，进一步影响社会稳定。

(2) 对于牧场来讲，根据 2000 年白音锡勒牧场统计年报，其国民生产总值是 6 050 万元，其中畜牧业产值是 2 736 万元，占 45%。通过以上分析，牧场从畜牧业社会净利润中分得的利润高达 44%。可见畜牧业经营对于牧场是至关重要的，畜牧业的压缩会给牧场收入造成很大的影响。但通过“羔羊生产战略”的实施及畜产品加工业的发展，可以弥补这一损失。

(3) 对于牧民来讲，畜牧业收入几乎是其唯一的生活来源，牲畜数量的减少直接降低其收入。因此，如果没有为牧民找到其他的收入来源，压缩牲畜数量的目标无法实现。

(4) 对于运输户来讲，这里只计算了其运输草料的收入。即使牲畜数量减少，但过冬草料仍需储备，所以运输户从中赚得的收入下降不大。

通过以上分析可以看出，如果压缩畜牧业，受其影响最大的是牧民，尤其是以畜牧业经营作为唯一收入来源的牧民；其次是牧场。而对于整个地区来讲，压缩畜牧业这不仅关系到地方的经济利益，更重要的是关系到当地的社会稳定、民族关系等问题。如果处理不当，畜牧业的压缩会给当地带来巨大的影响。国家和地方的决策者必须从实际出发，针对以上这两个问题推出一系列稳定市场的措施。但要想从根本上解决，必须调整产业结构，一方面开发新的畜产品加工产品，提高科技含量；另一方面，利用现有资源发展其他产业，例如旅游业。只要当地决策者从实际出发，寻找合适的替代产业以弥补由于畜牧业压缩带来的损失，就会实现保护草场和经济发展双赢的目标。

3.3 草场退化的社会经济原因

要分析草场退化的社会经济原因，有必要先对锡林郭勒草原自然生态系统的脆弱性做一个简单介绍。锡林郭勒草原是中国典型草原主要分布区之一，年降水量为 350 mm，属温带半干旱气候，土壤多为砂壤。可由于全球气候变化，人类长期过度利用以及不合理的开垦，使草场退化面积占总面积的 90%以上(国家环保局 2000)，原来稳定的典型草原生态系统面临着沙漠化的危险，我们所讲的脆弱性也是指，如果锡林郭勒草原继续退化，它必将引起典型草原生态系统的荒漠化，而这是人类所不愿接受的。

3.3.1 经济原因

我们认为，引起目前草场退化的经济原因主要有以下 3 方面：

(1) 由于历史原因，造成草地使用的生态错位。从生态角度讲，农业区应分布在年降水量大于 400mm 的地区，而在锡林郭勒草原，年降水量只有 350 mm，总体来说是不适合农业生产的。但是从 20 世纪 50 年代开始，该地区就开始进行农业生产。究其原因，一方面由于当时国内生产不足且市场不发达，当地居民的粮食和蔬菜只能自给自足；另一方面，20 世纪 60 年代国家提出“全民大办农业，争取粮食提前过关”的号召，锡林浩特地区农作物的播种面积猛增，又经过 20 世纪 70 年代建设兵团开荒垦地，使得当地的耕地面积从 1953 年的 86 亩增加到 1985 年的 332 500 亩。对草场如此大规模的开垦，且此地又降水不足，定会导致这些地区的沙化。

(2) 传统自然资源种类单一决定了牧民单一的生产方式(畜牧业)，因此造成对草场的过分利用。锡林浩特地区天然草场面积占总面积的 90%以上，从草场资源来看，其资源丰富，但换个角度，这一优势使当地牧民觉得草原是取之不尽、用之不竭的，形成了长期依靠畜牧业，并不断扩大牲畜数量的发展趋势，忽视了畜产品质量的提高及其加工业的发展，也限制了其他产业的发展。

(3) 资源配置缺乏效率的财产权结构，造成自然资源的过度使用。解放以前，锡林浩特地区经济属单纯的牧业经济成分，私有经济占绝对优势。1956年社会主义改造之后，草场和牲畜归集体所有，1958年以后牧区一度取消了自留畜。1979年开始实行家庭联产承包责任制，草场仍归集体所有，承包给牧民，牧民向牧场交草场使用费和牲畜卫生费及管理费。从上面对牧民的微观财务分析中，我们也可以看出：草场退化虽使牧民增加了畜牧业经营的投入，包括买草料和灾害损失，但这只是环境成本的一部分。由于草场归集体所有，所以有关草场退化的治理费用(如治沙费、治蝗费等)是由国家来出的，牧民作为使用者则不需为此花一分钱。所以畜牧业经营的社会成本是大于私人成本的，产生了外部性，因此与社会资源最优配置相比，现行的财产权结构，主要导致以下偏差(见图3-5)：牲畜数量超过了社会最优数量Q，畜产品产量过多；草场资源被过度使用；畜产品价格偏低；牧民为了提高收入，不断扩大牲畜数量，而绝不会自动根据草场现状控制牲畜数量。而且在实行承包制的同时，又没有出台相应的管理制度和建立集体决策机构，以限制牲畜数量，防止草场过度使用，使这种低效率的产权结构一直发挥其负面作用，尤其是近3年连续的干旱，更加剧了草畜矛盾。

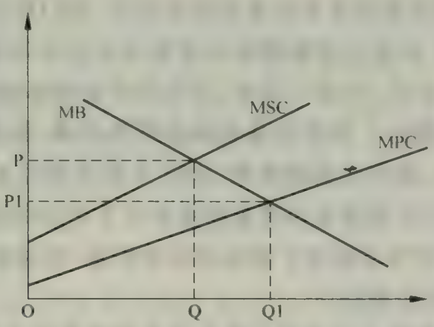


图3-5　边际私人成本与边际社会成本的差异造成资源过度利用

注：图中纵坐标为畜产品价格，横坐标为畜产品数量。由于产生了外部不经济性，边际社会成本MSC大于边际私人成本MPC，差额是外部环境成本。牧民个人利益最大化的牲畜数量是由边际效益MB和MPC决定的Q1，价格为P1；而就整个社会来讲，社会利益最大化的牲畜数量是由MB和MSC决定的Q，价格为P。

3.3.2　社会原因

草场退化除了上述的经济原因，还有社会原因，主要体现在以下3方面：

(1) 历史上发展落后。一直以来，内蒙古地区经济发展水平都比较落后，也限制了一些产业，如畜产品加工工业的发展。经济落后与这些产业的萎靡不振似乎形成了一种恶性循环，经济落后的环境限制了企业的发展，在当地的调查过程中，许多人都认为当地经济的发展缺少“龙头”企业的带动，而企业无法发展必然使经济也难以发展。由于畜产品加工业发展步履艰难，牧民也只能通过牲畜初级产品的数量增加来提高收入，从而导致草场的过度利用。

(2) 人口文化素质低。长期以来，内蒙古地区尤其是牧区教育落后，信息闭塞，人口

文化素质普遍不高，而且其现有教育体制也不利于人口文化素质的提高。锡林郭勒草原地广人稀，办学困难。责任制实行之前，由牧场统一办学，可随着责任制的实行，牧场的一些社区服务职能却削弱了。现在牧区的孩子大部分都在锡林浩特市上学，学费加住宿费，一年的总费用就需 1 万元，这对于普通的牧民家庭来说是一笔不小的支出。如此重的经济负担必然会导致一部分孩子辍学，限制了当地人口的文化素质的提高，这对当地的经济发展和环境保护无疑会有很大的影响。

(3) 交通不发达，能量流、物质流和信息流不通畅。当地交通不发达对经济发展造成了很大的影响，一方面使物质流和能量流的成本有相当大的增加；另一方面也限制了与外界的信息交流。这种状况也会间接对环境保护造成障碍。

3.4 结论及建议

3.4.1 结论

通过以上对白音锡勒牧场畜牧业经营现状的分析，我们得出以下结论：

(1) 从经济角度来看，目前白音锡勒牧场畜牧业经营的环境成本损失已占其总收入的 17%，是各国平均最高水平 5%的 3 倍多，可见其环境破坏的程度相当严重。

(2) 环境破坏已严重制约了保护区畜牧业经济的发展，如果在畜牧业成本核算中计算净收益时考虑环境成本，则白音锡勒牧场 2000 年真实净收益将减少近 1/3；从某牧户的财务分析可以看出，由于环境退化而带来的损失占总支出的近一半。

(3) 连续 3 年的自然灾害已花光了牧民多年的积蓄，如果环境不能得到治理，自然灾害持续下去，牧民生活将无法维持。

(4) 在目前草原牧区畜牧业经营对自然条件依赖性很强的条件下，仅依靠畜牧业，经济结构非常脆弱，当地决策者必须从实际出发，改变现有单一的产业结构，寻找新的经济出路，例如旅游业。事实上，牧户个体经营和牧场旅游业的开展正反映了牧民和牧场的这一需求。

(5) 一旦环境严重破坏，牧民的基本生活条件无法满足，就更不可能找到新的出路发展经济。

(6) 通过对利益分配的分析得出牧民真正从畜牧业中获得的社会净利润为人均 359.8 元，比某牧户的人均收入 972 元低近 600 元，虽然存在此牧户经济水平中等偏上的原因，但从中我们也可以得出：当地畜牧业经营存在外部性。

(7) 如果调整产业结构，压缩畜牧业，用其他产业部分替代畜牧业，受影响最大的是牧民，尤其是以畜牧业经营作为唯一收入来源的牧民，其次是牧场。但只要当地决策者从实际出发，寻找合适的替代产业以弥补由于畜牧业压缩带来的损失，就会实现保护草场和经济发展双赢的目标。

3.4.2　建议

（1）从畜牧业经营角度，迫切需要“以草定畜”；并在经营方式上增加舍饲牲畜比例；通过“羔羊生产战略”等生产策略的调整，提高牲畜产品质量，增加收入；通过发展畜产品加工业，提高牲畜产品的附加值，增加牧民收入。

（2）除了在畜牧业内部的调整，更为重要的是，应该尽快改变牧区单一畜牧业生产结构的现状，利用现有资源，开辟新的产业，寻找新的经济来源，减轻畜牧业对草原环境的压力，进而保护和恢复草场生产力。对于具有丰富旅游资源、风景优美的锡林郭勒大草原，生态旅游无疑是平衡资源保护和经济发展的一种较好的选择。

第 4 章

生态旅游对锡林郭勒生物圈保护区发展的作用

本文通过对锡林郭勒生物圈保护区旅游资源的介绍及其游憩价值的分析计算，从经济角度分析生态旅游在产业结构调整中部分替代畜牧业的可行性，分析论证旅游作为当地的一种可持续发展产业的可能性。同时，社区的参与及受益是生态旅游成功替代牧业的基本保证，通过一些具体案例分析锡林郭勒草原社区开展旅游的不同经营方式，从实际操作角度对生态旅游的开展给出具体建议。最后，从生态旅游管理角度出发，分析保护区开展并管理生态旅游的现状、存在的问题及建议。

4.1 发展生态旅游减缓过度放牧的经济可行性

目前草原牧区单纯的畜牧业发展给草场带来了巨大的压力，同时也反过来阻碍了当地经济的进一步发展，因此进行产业结构调整势在必行。就锡林郭勒的自然资源状况而言，生态旅游不失为一种很好的选择。一方面，由于是全国唯一的生物圈草原自然保护区，锡林郭勒有着丰富的生态旅游资源；另一方面，随着公众环境意识的提高，生态旅游作为旅游产业中的一个热点，其发展日新月异。在过去的几年中当地人民正是在做着这样一种尝试，并取得了一些收益，但是对于生态旅游的潜力有多大，它到底会带来多大的经济收益，在多大程度上可以代替传统的畜牧业，这些问题上并没有一个明确的答案。以下将通过旅行费用法（TCM）建立模型并估算锡林郭勒生物圈保护区潜在的最大旅游收益，从经济角度来回答旅游能在多大程度上替代畜牧业生产。

4.1.1 保护区发展生态旅游的优势和特色

锡林郭勒草原自然保护区成立于 1985 年，1987 年被 UNESCO/MAB 国际协调理事会接纳为国际生物圈保护区网络成员。它是中国建立的第一个具有典型性和代表性的草原类自然保护区，具有天然的旅游资源和优势。

草原上居住着具有悠久历史和丰富文化底蕴的蒙古族人民，他们的那种社会经济和地理环境相适应的生活习俗，以及特有的衣食住行传统和豪爽、淳朴的待人接物的礼仪，对游客来说无一不具有强大的吸引力。

而且，该地区的旅游资源具有保护区所特有的科学色彩。中国科学院内蒙古草原生态系统定位研究站1979年在此成立。20年来，每年都有数十名到百名从事植物、动物、土壤、草原、微生物等不同专业的国内外科学家来工作站进行草原生态系统科学研究，因此积累了大量的资料，并取得了丰硕的科研成果，已经成为我国唯一的长期、综合、系统地进行温带草原科学研究的基地，不仅在国内有较高的知名度，在国际上也有一定影响。保护区内设有永久性采样地、实验林场、科研监测中心、植物标本室、展厅、实验室等基础设施，已成为科研、监测、教育与培训的基地，所有这些都可以作为宣传草原生态系统知识的窗口向游客开放。因此，与一般的草原旅游景点不同，这里具有作为生态旅游宣传科普、进行环境教育的强大的科研后盾，形成了自己独特的旅游特色和优势。

另外，由于锡林浩特市位于锡林郭勒生物圈保护区内，该地区可以充分利用城市的交通、基础设施的便利来开展旅游，形成以城市为中心，向四周放射的旅游发展路线。锡林浩特市已被国家计委、旅游局列为全国优先发展的70家旅游城市之一，保护区也是内蒙古自治区五大王牌旅游区之一。因此，就整体环境而言，该地区发展旅游具有巨大的潜在优势，应充分挖掘并加以利用。保护区内的旅游景观分类见表4-1。

表4-1 锡林郭勒草原旅游资源分类

旅游景观类型	主要旅游资源
自然旅游景观	蒙古高原景观 草甸草原与典型草原景观 火山与火山平台景观 高原湖泊景观 锡林河河曲与瀑布景观 沙地及其森林景观
社会-人文景观	蒙古包 蒙古族民族服饰 蒙古族运动 蒙古族生产方式 蒙古族祭敖包
历史遗迹景观	元上都遗址 金壕遗址 贝子庙

引自陈佐忠，2000

4.1.3 从经济角度论证生态旅游代替畜牧业的可行性

(1) 旅行费用法

在本次研究中，我们将以经典的旅行费用法TCM（Travel Cost Method）模型为基

础，按照 TCM 中求旅游需求曲线的方法，得到研究地的旅游需求曲线，并配合参数的预测计算，求出旅游地最大的经济收益。具体方法见专栏 4-1。

(2) 旅游地最大经济收益预测

通过对旅游率和旅游花费建立模型，得到旅游收益函数为专栏 4-1 中的式(7)：

$$R=POP\times[68.734-9.062\times LN(TC)]\times TC$$

假定客源地的总人口 POP 为定值，通过上式求导可以得出，当旅行费用 TC 为 724 元/人时，此时的客源地旅游率 ARR 为 9.062%，旅游收益 R 最大。

专栏 4-1 旅行费用法预测最大旅游收益

- **预测方法**

采用 TCM 方法中的分区旅行费用法 ZTCM (Zonal Travel Cost Method)，在根据客源地对游客分区的基础上，对各区的游客统计数据进行回归拟合，得到了一个以地区旅游率为应变量，该区平均旅行费用、年龄、收入、教育程度等为自变量的多元统计方程(Willis and Garrod 1991)。剔除该方程中那些不显著的变量，所得到的就是研究地的旅游需求函数如下式(1)，当然这个需求函数不同于一般的需求函数，不是以消费数量为应变量，而是以旅游率即消费率为应变量。以旅游率和旅行费用分别为横纵坐标，可以画出一条旅游需求曲线，曲线的形状由旅行费用和旅游率的关系决定，而其他外生变量决定了曲线在坐标系中的位置。

$$ARR_i=f\ (TC_i, X_1, X_2, \cdots, X_n) \tag{1}$$

ARR_i——旅游率，$ARR_i=V_i/P_i$；

V_i——根据抽样调查结果推算出的一定时间内 i 区域中到研究地的总旅游人数；

P_i——i 区域的人口总数；

TC_i——i 区域到研究地的平均旅行费用；

X_i——i 区域旅游者的一系列社会经济变量的区域均值。

通过对那些外生变量在某一个客源地的统计值进行一个合理预测，比如 10 年或 20 年后某客源地游客的平均年龄、教育程度、收入大约是多少，运用这些预测值就可以得到未来某一时刻该客源地对研究地旅游的需求曲线。找出这条曲线上横纵坐标乘积最大的点，其横坐标即未来旅游收益最大时的平均旅行费用，纵坐标即未来旅游收益最大时地区平均旅游率，将它乘以未来的客源地人口，即得到未来某一时刻该客源地给研究旅游地所带来的最大旅游收益。对所有的客源地都做类似的工作，然后将其加总，结果为未来某一时刻研究地的最大旅游收益。对多个年份均进行类似计算，可以比较清楚地看到该地区的旅游发展前景。

客源地旅游收益的计算函数为下式(2)

$$R_i=ARR_i\times TC_i\times POP_i \tag{2}$$

R_i 表示客源地 i 的旅游收益，ARR_i 和 TC_i 表示客源地 i 需求曲线上任一点相应的旅行费用和旅游率，POP_i 表示客源地 i 的人口数，此处指任一时刻的人口数。将所有客源地的旅游收益加总为总收益，如式(3)。

$$R=\sum R_i=\sum ARR_i\times TC_i\times POP_i \quad (i=1,2,3\cdots) \tag{3}$$

由于假设未来某一时刻所有客源地的旅游需求曲线都一样，即对所有的客源地而言，所有的外生变量均取一定值，可采用全国的均值，如全民的平均收入、平均学历等，所以式(3)可简化为下式(4)

$$R=ARR\times TC\times POP \tag{4}$$

ARR 和 TC 表示旅游需求曲线上任一点相应的旅行费用和旅游率，POP 表示所有客源地的人口数之和。要求出旅游的最大收益就是要求出上式(4)的最大值。

续专栏 4-1

- **问卷调查**

建立需求曲线所需的数据主要来源于研究地的问卷调查。问卷调查时间为 2001 年 7 月至 8 月。通过实地预调查发现，锡林郭勒生物圈保护区的游客主要分为两类，本地(即锡林浩特市内)游客和外地游客，两者的数量比例大约为 1∶2。由于两者在消费行为上差别很大，我们将这两类游客区别对待。对于那些本地游客，一次旅行的花费内容相对简单些，主要包括从锡林浩特市内去度假村的交通费用以及在度假村中的餐饮和娱乐消费。这些消费数额不大，游客之间的消费差别也不大，个人 1 次出游的费用多在 70 元～80 元间。因而在后面的计算中，取平均值 75 元/人参与计算。外地游客相对本地游客而言，费用要高得多(包括从游客居住地到锡林浩特市的往返交通费用和旅行全过程中的食宿费用)，因此虽然数量居少，但在旅游收益中所占的比例却很大，这从第 5 部分的计算值中也可以看到。况且外地游客的发展潜力也要大得多。因此我们将这些外地游客作为研究的重点，问卷调查主要针对外地游客。最后共得到外地游客的调查问卷 115 份，有效卷 89 份。

- **建立模型**

获得数据之后，按照 TCM 中的方法对游客按客源地分区，选取了游客人数最多的 10 个城市参与下一步的回归拟合。本研究中的回归分析采用 SPSS 统计软件。通过对数据点与拟合曲线的吻合度的直观观察，以及回归的显著性的判断，表明在所有的回归形式中对数形式的模型是最令人满意的。因此将 TC 变形为对数形式，再与其他变量一起参加多元回归，回归结果如下式：

$$ARR=119.11-13.99LN(TC)+1.72\,SATI+3.75\times10^{-3}INCO+0.26\,EDU-0.79\,AGE \tag{5}$$

式中 $LN(TC)$ 表示 TC 的对数形式，$SATI$ 是游客满意程度，$INCO$ 是游客的月收入，EDU 是游客的学历，AGE 是游客的年龄。

这个多元回归的显著性水平 $Sig.=0.409$，大于通常要求的 0.05 的显著要求，因此结果并不理想。但是，如果只用 $LN(TC)$ 做自变量进行一次一元线性回归，得到方程(6)：

$$ARR=68.734-9.062\times LN(TC) \tag{6}$$

回归的相关性 $R^2=0.365$，显著性 $Sig.=0.064$，接近 0.05 的显著性要求，考虑到参与回归是小样本，只有十一个，这个结果是可接受的。

将式(6)代入式(4)，得到的旅游收益函数为：

$$R=POP\times[68.734-9.062\times LN(TC)]\times TC \tag{7}$$

将未来不同年份的人口数量预测值代入上述旅游收益预测模型，即可预测未来不同时期(2005 年、2010 年、2015 年、2020 年)锡林郭勒生物圈保护区旅游的最大收益，详见表 4-2。必须注意的是，表中外地游客的最大旅游消费并不是单指给锡林浩特市带来的旅游收益，有很大一部分花费实际用于从出发地到旅游地的交通费用，因此它实际代表的是由于锡林郭勒草原开展旅游而给整个国民经济所造成的收益的增加。从样本获得的数据计算得到外地游客在该地区的花费为其全程总花费的 47.8%，从而得到不同年度外地游客给该地区带来的经济收益，见表中第 4 栏。同样从样本数据中获得本地游客的花费为外地游客的 22.5%，因而得到不同年度当地游客带来的经济效益，见表中第 5 栏。第 6 栏“总计”为外地游客给该地区带来的经济效益(第 4 栏)与本地游客带来的经济效益(第 5 栏)之和。

表 4-2 锡林郭勒草原未来旅游最大收益预测

年份	中国总人口数/亿	外地游客最大旅游花费/亿元	给该地区带来的经济收益/亿元	当地游客带来的经济收益/亿元	总计/亿元
2000	12.7	10.85	5.18	1.14	6.32
2005	13.25	12.04	5.75	1.26	6.83
2010	13.8	13.24	6.33	1.39	7.72
2015	14.25	14.32	6.84	1.50	8.34
2020	14.7	15.30	7.31	1.61	8.92

必须说明的是,表 4-2 中得到的旅游收益最大值是完全从经济学上商品价格与购买数量的关系计算得到的。研究中做了如下假设:① 目前的客源地不随时间改变而改变,即不增加新的客源地,原有客源地也继续存在;② 多元回归中除了我们所考虑的自变量外,没有其他重要的自变量会显著的影响客源地的旅游率;③ 所有城市的人口数量均按照同一增长速度进行预测。由于上述的种种假设,使得该预测结果的实际应用会受到一些限制。但我们可以用这个预测值与目前的旅游真实收益进行比较,找到两者间的差距,为制定未来的发展目标提供依据。另外,由于假定将来不增加新的客源地,因此这些假设所导致的结果只会低估研究地的未来旅游收益,所以我们得到预测值只是未来旅游收益的下限,用这个下限值与所需要替代的畜牧业产值进行比较,如果下限都可以满足这种替代要求的话,那么以旅游部分替代畜牧业必然是可行的。

(3) 生态旅游部分替代畜牧业的可行性分析

下面通过分析保护区内 GDP 的结构和分布,以及旅游业的经济潜力与畜牧业产值的比较,说明生态旅游作为替代产业在经济上的可行性。

限于数据的可获得性,我们这里以 1998 年保护区内 GDP 的构成来分析各行业在经济中的比重。1998 年 GDP 总值为 18.70 亿元,其中第一产业(以畜牧业为主)2.07 亿;第二产业(工业)为 12.03 亿元,其中油田产值就占第二产业总产值的约 90%;第三产业(包括旅游业)为 4.60 亿元,GDP 构成及各部分所占比例见图 4-1。从图中可看到,GDP 主要贡献来自于工业,占总量的 81%,畜牧业为 14%,而旅游业所占比例不超过 5%。2000 年 GDP 总值约为 20 亿元,假如工业产值所占比例不变,而以旅游业全部取代畜牧业,则旅游业需要创造 3.8 亿元的年产值。与表 4-2 中的 2000 年预测值 6.32 亿相比,旅游业应该有此潜力。当然,用旅游业全部替代畜牧业是不可能的,也没有必要。因为从生态学角度出发,正常的天然草场的生长和维护也需要一定的载畜量。

由锡林浩特市旅游统计资料得到,2000 年保护区旅游带来的经济收益为 7083 万元,而上述计算得到其理论最大值为 6.32 亿。这可能是由以下两方面的原因造成的:第一,由于经营、管理等方面的原因,目前保护区内的旅游并没有得到理论上的最大收益,因此如何制定科学的经营管理政策,合理开发旅游还有许多工作要做;第二,旅游带来的收益有很大一部分被外来的经营单位带走,因此减少了对当地经济的贡献,而旅游业成功替代过度放牧的关键是广大的当地牧民能够从旅游中受益,因此如何鼓励草原社区居民参与旅游并从中受益将是产业调整的关键,这个问题将在下文谈到。

当然，强调加大旅游开发的程度，也应该注意"过犹不及"的问题，过度的旅游开发同过度放牧一样也会造成极其可怕的环境退化。这意味着旅游开发同样会存在由于资源破坏而造成的环境成本，但这种成本是可以通过旅游的科学规划和严格管理而降低的。尤其在像锡林郭勒这样的旅游开发尚处于初期阶段的地方，起步时的严格管理在降低环境成本方面会非常有效。因此制定生态旅游规划、规范旅游开发行为、严格旅游管理，都是在将来工作中应该注意的问题。

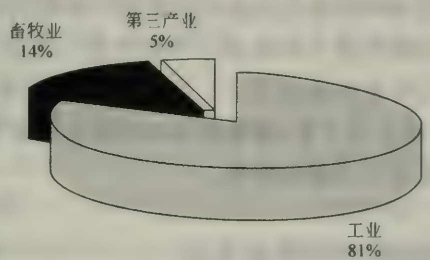


图 4-1　1998 年锡林郭勒生物圈保护区 GDP 构成

4.2　保护区生态旅游与社区参与

相对于天然畜牧业对草场的直接索取式利用，生态旅游则是一种间接的对自然资源的利用方式。以上从锡林郭勒草原旅游业潜在的经济效益论证了生态旅游作为部分替代畜牧业的产业在保护区内发展的可能性。然而，要在真正意义上替代畜牧业，必须让当地牧民真正从旅游中受益，从而使得在牧民总收入不减少的前提下，按照草场承载能力减少牲畜数量，才能有效改变原来以畜牧业为唯一生活来源的生产生活方式，从而达到保护草场资源的目的。如何使牧民真正参与生态旅游并从中受益，成为本研究的重点研究内容之一。

下面通过对保护区内旅游经营现状的调查，分析社区参与旅游经营的规模和程度；并通过对个别典型牧户经营的分析，找出目前社区参与旅游过程中存在的问题，进而给出相应的建议。

4.2.1　社区参与及其必要性

"社区参与"是一个意义非常广泛的概念，它在社会学范畴内是指，社区居民作为社区参与的主体，参与和管理社区各项事务的行为。（王刚，汪丽萍 1998；Peterson 等 1999；刘纬华 2000）本文中的"社区参与"，主要是指以锡林郭勒生物圈保护区的牧户作为主体，在保护区的范围内经营旅游的行为。其最终目的，是既保护锡林郭勒生物圈保护区的草场资源，又使牧民的生活水平得到提高，从而达到保护区的可持续发展。

对于目前的锡林郭勒草原来说，社区参与旅游并从中受益尤其具有其必要性。在茫茫草原上，牧民是主人。使锡林郭勒草原再度拥有昔日的美景，是每一个牧民的心愿。在

开展旅游并使其部分替代畜牧业以恢复草场资源的过程中，牧民也是难以取代的主体。

畜牧业几乎是所有牧民主要的甚至是唯一的谋生手段，限制牲畜量，将无可避免的影响到牧民的收入。那么，为了使限制载畜量真正可行，用以替代畜牧业的旅游经营需要使牧民能够从中获得一定的收入，并且经营旅游带来的收入，应不低于因限制载畜量而使牧民减少的收入。

畜牧业是牧民的主要谋生方式，畜牧业的收入是他们的主要经济来源。由于短期经济利益的冲突，限制载畜量很可能会引起牧民的抵触。使牧民参与到旅游经营中来，并从中获得相当的收益，不失为解决这一冲突的一个好方法。蒙古人的传统生活习惯和当地的风土人情，也是游客慕名而来的原因之一。从这个角度讲，牧民本身就是无可代替的旅游资源。使牧民参与到旅游经营中来，能够使当地的旅游经营更具特色，更有吸引力。因此，这有助于使旅游活动更具有当地的特色。

4.2.2 保护区内旅游度假村的经营类型

据调查，保护区范围内的旅游经营点按其经营方式分，大致可以分为 6 类，如表 4-3。

从牧户参与并经营旅游的角度而言，表 4-3 中前 3 项(个人承包给个人、单位承包给个人、单位招待)与牧户经营旅游无关，基本是在原国营单位的三产基础上发展起来的，但是这类度假村目前是保护区内规模最大的旅游经营方式(这里称之为非牧户经营的度假村)；下岗职工经营的度假村规模较小，只是极个别的现象，在以下不做特别讨论；最后两种类型是社区牧户直接参与经营的旅游，从接待规模来看，目前牧户经营只有少数个别几家，牧户联营只有 1 家，因此保护区内社区参与旅游尚处于萌芽状态。

4.2.3 案例调查与分析

根据上述调查分析，按照不同的经营机制我们将锡林郭勒生物圈保护区内的旅游经营方式归纳为 3 类：非牧户经营的度假村、牧户个体经营的度假村和牧户联营的度假村。以下通过对具体案例的调查，从社区牧民的旅游参与及收益程度方面，讨论这 3 种经营形式的特点和优劣。

4.2.3.1 非牧户经营方式

各种非牧户经营的度假村是目前保护区内旅游经营的主要形式。这些度假村最初基本是当地国营单位的三产，现在多数给单位中的职工承包，有的则将产权出让给个人(如希日塔拉度假村)。

我们以较大规模的葛根敖包度假村为例，分析度假村的经营及其与当地社区参与的关系。该度假村建于 1995 年，由内蒙古财政、交通、电力 3 家共同投资 400 多万元兴建，现产权归内蒙古财政厅，由绿达公司承包经营。度假村共有蒙古包 16 个，可接待住宿 100 多人，一次可接待餐饮客人 300 多人，近几年的投入、收入及游客人数见表 4-4。由表 4-4 可知，兴建如此大规模的度假村除了大笔起始投资外，每年的维护、更新都需要上百万资金，这不是一般社区牧民所能承受的。

表 4-3　保护区内旅游经营方式分类

类　型	度　假　村	接　待　规　模
个人承包给个人	希日塔拉	70 个蒙古包，可接待住宿 200 人，就餐 400 人
单位承包给个人	扎格斯台湖(保护区管理局)	9 个蒙古包：2 个供住宿(5 人＋7 人)，7 个就餐用蒙古包；
	渔场(白音锡勒旅游服务中心)	8 顶蒙古包，一次可接待 150 人，住宿 20 人；
	成吉思汗金顶大帐(属旅游局和邮政局经营)	5 个蒙古包；
	葛根敖包(绿达公司)	19 个蒙古包，每天可接待 100 多人住宿，300 多人餐饮；
单位招待所	风力发电厂	7 个蒙古包；
下岗职工经营	白音高勒度假村(张美英，锡市毛纺厂)等	4 个蒙古包，每天可接待 80 人～90 人；
牧户个体经营	诺日布	6 顶蒙古包，就餐 60 多人，住宿 20 多人；
	包玉	15 顶蒙古包，400 人就餐，200 人住宿；
牧户联营	奥奇牧村	16 个毡包。

表 4-4　葛根敖包度假村的旅游经营情况

	累计投入/万元	营业收入/万元	税金/万元	游客人数/人
1997	91.6	64	3.2	13924
1998	123.6	87	4.3	20179
1999	143.6	94	4.7	14832
2000	165	70	3.5	12000

度假村雇佣临时工 20 多人，全部是从锡林浩特市劳动力市场雇来的，其中当地牧民只有 3 个。当问及为什么不多用当地牧民时，经营者回答说当地牧民太自由散漫，总回家，不好管理。

该度假村 2000 年旅游季节共宰杀了 700 多只羊，做成各种特色食品卖给游客，但这些羊并不是从当地牧民手中买的，而是从西乌旗该公司自己的牧场购进的。其余一些经营用的奶制品从当地牧户中购得。

通过以上分析可以看出，该种类型的度假村虽然每年能给当地上缴一些税金(一年仅 3 万元～4 万元)，但主要旅游收益都被外来经营者(绿达公司)拿走了。而且在解决当地劳动力就业、增加当地畜产品销售利润方面，几乎没有给当地社区带来任何利益，因此也就谈不上替代畜牧业生产。

4.2.3.2　个体经营方式

为了了解目前牧民个体经营旅游的情况，笔者对两户人家进行了比较详细的访谈。访谈的主要目的是了解这种经营方式对放牧的替代性如何，具体分为以下各部分进行：一

是了解旅游经营和放牧之间存在哪些资源上的争夺(如时间、资金、劳动力和草场);二是比较二者带来的收入差异(这两部分材料基本上可以由直接询问获得);第三点是调查牧户对经营旅游和进行放牧的偏好,这部分由直接询问很难得到满意的反馈,一般通过询问"觉得经营旅游和放牧哪个更辛苦","如果年景好了,放牧得到的收入多了,是否继续经营旅游"以及了解牧民开始经营旅游的动机来体会他们对二者的偏好差异;另外,为了了解目前的旅游经营市场,笔者也调查了个体经营的规模、提供的活动项目、收费标准等内容。

为了分析个体经营方式的收益、特点、对旅游的偏好及推广的可能性,我们选择了2户牧民个体经营的旅游度假村,作为案例调查和分析解剖的对象。访谈内容的描述见专栏4-2和专栏4-3,为了便于分析比较,将有关调查数据及信息整理汇集在表4-5中。

首先分析旅游的经济收益情况及其与传统的畜牧业收入的比较。如表4-5所示,可以看到2户人家在2000年从旅游获得的收入已经同传统的畜牧业收入不相上下(这是由畜牧业的收入下降和旅游经营收入的上升共同造成的)。说明在目前的状况下,旅游作为畜牧业的替代产业在收入方面是可行的。

然后,再来分析对旅游的"个人偏好"。从专栏4-2和专栏4-3的访谈内容可以很容易发现诺尔布和包玉对于经营旅游的偏好存在很大的差异,如表4-5。二人经营旅游的开始有着很大的不同。诺尔布在20世纪90年代初就开始接触游客,但真正促使他经营旅游的是放牧的与日维艰。而包玉则在接触游客后,很快发现了当中的商机,几乎马上就开始了旅游经营。经营旅游,对于诺尔布而言是为了维持生活的无奈选择。但对于包玉来讲,经营旅游——无论年景好坏、放牧收入多少,始终是他生活的一部分。从这里可以很明显的反映出,在放牧和经营旅游之间,诺尔布偏好前者,而包玉对于二者的偏好则无明显的差异。

专栏4-2 对个体经营者诺尔布的访谈(座谈时间:2001年7月7日)

诺尔布和妻子与孩子们生活在一起,他们有两儿两女,加上媳妇、女婿、还有五六个孙子、外孙,组成了一个有十五六口人的大家庭。诺尔布刚刚退休,以前他是这里的乡党委书记,他的妻子是乡里的妇女主任,大儿子是团委书记,现在可能要接任党委书记了。

诺尔布家从1998年开始经营旅游,但是实际上他们接待游客的历史要更长一些。大约在1990年或更早,有一些外省市的客人拜访盟里或市里的领导,他们希望能看看真正的牧民生活,而当时锡盟的旅游基本上没有开展起来。因为诺尔布是乡里的领导,比较可靠,家里的条件也相对比较好,又居住在城外,保持了牧民生活的原貌,所以有时领导会将客人带到诺尔布家参观、骑马、吃一些牧民自己制作的奶食品。渐渐的,随着近几年周围建起了度假村,草原旅游业越来越兴旺,而由于雪灾、干旱的原因,单单依靠放牧获得的收入越来越少,诺尔布也开始经营旅游,开展的活动项目和以前接待领导的客人时没有太大的差别,当然,现在要明码标价的收费了。

从1998年到2000年,诺尔布的旅游规模逐渐扩大。1998年买了4顶蒙古毡包,接待了300人~400人次,1999年加了1顶,5顶蒙古包,接待了大约1000人次,2000年再加1顶,6顶蒙古包,接待1000人次,今年计划仍然支6顶蒙古包。提供的旅游活动包括骑马、放羊、套马和摔跤表演,以及草原的风味餐(如烤全羊)和各种牧民自制的奶食品。收费标准是风味餐费每人50元,住宿费每人每晚20元,一日三餐加住宿费每人每日100元。

续专栏 4-2

诺尔布家里的人，除了到乡政府上班的以外，都在家从事放牧，因此经营旅游时不缺人手。以现在的规模，他们可以在 1 天内接待 150 位游客，容纳 20 多人住宿。诺尔布曾在 1998 年开业的时候，请北京电视台来做过 1 次报导，这是他在经营过程中进行的唯一的 1 次宣传活动。据他介绍，来这里的客人中有相当一部分是市里的领导介绍来的，因为诺尔布家距锡林浩特市不远，又是在公路旁边，还有一小部分游客是因路过而停留的。实际上，这里的客源十分依赖诺尔布与其他领导在工作中建立的关系。

诺尔布家收入最高时是 1996、1997 年，年收入可以达到 6 万元～7 万元。但是，连续三年的雪灾，和近两年的干旱，使诺尔布已经支付了 6 万元的抗灾款（主要用于购买过冬的草料），同时也使放牧获得的净收益大大降低。2000 年诺尔布家的年收入只有 2 万多元，当中有 1 万多元是由旅游经营获得的。老人家说已经“入不敷出”，去年雪灾时借贷的草料，还赊着没有还。

诺尔布经营旅游，主要是因为觉得经营牧业越来越困难，希望能通过旅游经营提高收入——至少不降低那么多。从 1998 年至 2000 年的收入情况来看，诺尔布的做法是非常明智的。虽然，诺尔布承认在灾情非常严重时，从放牧获得的收入继续大幅度下降的时候，可能会减少在放牧的投入，以旅游经营作为主业和收入的补充来源。但是在访谈中，他同样表示如果年景好了，就要考虑是否还要经营旅游。并且觉得经营旅游比放牧累，还认为旅游要在保证牧业不受影响的前提之下经营。

容易看出，诺尔布经营旅游只是在牧业的收入下降时的无奈之举，他希望能有个好年景，回到以往单纯的放牧生活。

专栏 4-3　对个体经营者包玉的访谈（2001 年 7 月 10 日）

包玉家属跃进苏木（相当于内地的乡或镇），据锡林浩特市不太远，但是离公路有一段距离，车要在草原上好一阵颠簸才能到达。远远地可以看见一个红砖砌成的小院，是一家人居住的地方，旁边不远一排彩旗迎风飘扬，立着 2 列 10 个水泥砌成的蒙古包，应该就是为招待旅客准备的了。这样看上去，包玉家旅游经营的规模比一些单位自营的度假村还要大一些。

包玉和妻子生活在这里。他们有 2 个儿子和 1 个女儿，其中大儿子已经结婚了。儿女们平时都住在市里，户口也迁走了，偶尔回来看看，女儿回来的多一些，帮着干一些家务，旅游季节也帮忙招待游客，但主要的经营还是靠老两口。包玉是市（盟）旅游局的司机，这对他经营旅游起了非常重要的作用。从屋里的陈设观察，这家人的生活水平在当地属于中上等。

笔者到的时候，打井队正在院门口打井。因为居住在草原深处，属于散居的牧民，用水用电都很不方便。用水要请人打井。打出水后，按 600 元/米收费，如果未打出水来，按 100 元/米收费，而这里打井一般要打 100 米以上。若是不打井，用水就要开车去载回来，一趟需要几十分钟。用电需要经过 4 个变压器从高压电线上引电入户，要花费七八万元。由于难以支付这笔费用，包玉家只得退而求其次，在后院用柴油机发电。同样，散居牧民的生活垃圾处理也是问题。包玉的做法是把所有的垃圾先焚烧再填埋，原则是尽量不影响草原的美观。

由于包玉一直是市（盟）旅游局的司机，在八十年代初他就有机会经常把要求参观牧户的游客带到自己家里来。因此，他在 1980 年就支起了两顶毡包，开始从事旅游经营。

包玉 1980 年开始经营旅游的时候，只有 2 顶毡包，发展到 2000 年，已经建起了 10 顶水泥蒙古包和 5 个毡包，最多可以招待 400 人就餐，为 200 人提供住宿。这里提供的旅游活动项目包括：骑马、射箭、风味餐、自制奶食品等。收费标准是一日三餐加住宿费每人每日100元，羊肉依市场价格

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按斤卖，一般一只羊卖 500 元～600 元，骑自家的马不收费(如果马不够用向邻居借，则需要游客付给邻居租金，一般是 20 元/小时、50 元/天)。包玉没有进行过一次一般意义上的广告宣传，来这里的游客以通过包玉在旅游局的关系和其他亲友介绍来的为主。经营的规模大了以后，15 顶蒙古包本身就是很好的广告，也能吸引一些游客。

包玉家收入最高的时候是 1996 和 1997 年，当时有 700 多只羊，放牧获得的年收入约有 3 万元，旅游经营也很兴旺，一年可以收入四五万元。近几年，一方面由于各种灾害放牧的成本大大提高，羊群的数量也减至 300 只左右，从放牧获得的收入不断下降；另一方面，由于更多度假村和个体旅游经营者的出现，加剧了开展旅游的竞争，而且干旱导致的草场退化直接影响了游客的数量，经营旅游获得的收入也有所降低。2000 年的收入只有 2 万余元，旅游经营和放牧大约各占 50%。不过，包玉夫妻的日常开支只有 500 元/月～600 元/月，因此，虽然 2 万元的年收入比以往大大减少，但对于子女都已经独立的老俩口来说，还是蛮富裕的。

包玉经营旅游的时间有 20 年，由此获得收入在总收入的 50%左右浮动。据他女儿讲，感觉上经营旅游和放牧的劳动量差不多，只是经营旅游在时间上更集中一些。而且，她还表示，即使年景好了，放牧所获得的收入提高了，也打算继续经营旅游。“两边一起发展总要好一点”，她朴素地表达着“风险分散”的思想，同时也告诉笔者，旅游经营在包玉家不单单是一种弥补放牧收入减少的方式。

表 4-5 诺尔布和包玉经营旅游的比较

	诺 尔 布	包 玉
放牧获得收入(2000 年)	10 000 元左右	10 000 元左右
经营旅游获得收入(2000 年)	10 000 元左右	10 000 元左右
个人偏好	更喜欢放牧，希望在年景好的时候单纯放牧，不经营旅游。	倾向于二者同时发展，无论年景如何，都既放牧又经营旅游。
个人经营旅游的可推广性*	存在困难	存在困难

*注：两人的社会关系，在他们的旅游经营中起了很重要的作用。对于缺乏这样的社会关系的牧民，这种经营方式在推广上可能会存在一些困难。

问题是，这样的偏好差异会对经营旅游造成什么样的影响呢？回答这个问题，需要明确本次调查的目的，由于调查的对象是保护区内所有的牧民，因此笔者所关心的是是否在牧民这个群体中，存在着一种“系统的偏好”——普遍地厌恶或喜爱旅游经营，只有这种“系统的偏好”才会影响整体上社区参与旅游的推广。通过走访牧民，笔者发现对待经营旅游的态度各种各样，有的人认为这里存在着新的希望，十分积极地投入到旅游经营当中；有的人选择以经营旅游度过当前畜牧业的低潮，盼望着草场能早早恢复，回到以前单纯的放牧生活；有的人觉得经营旅游和放牧相互不冲突，可以同时进行，以多种生产更快地致富。令人欣喜的是，尽管有一些牧民认为自己白手起家经营旅游十分困难，并且因此而持一种观望态度，但并没有人表示对那些经营旅游的牧民表示不满。总的来说，牧民对于经营旅游没有“系统”的排斥或接受，基本上是中性的态度。这个结论才是对这次调查有意义的结果，而每一个具体的人的偏好之间必然会存在或多或少的差异。笔者无意也不可能通过什么方式来使其统一化。

最后，来分析个人经营旅游这种方式的可推广性。利用自己的社会关系解决客源问题，是这两位经营者最大的共同点。面对各种广告宣传所需要的庞大费用，以及和旅行社直接联系所需的一笔不小的支付，如何吸引游客，是每个个体经营者的难题。诺尔布和包玉利用自己的工作关系和社会关系解决了这个问题，从这个角度看，他们经营旅游都有着自己的优势。换一个角度思考，这个优势在他们经营旅游的开始起到了近乎决定性的作用，也就是说，如果没有这个所谓的"优势"，他们很可能根本不会走上经营旅游的道路。那么，这就不仅仅是"优势"，而是经营旅游的"必要条件"了，也就不仅仅是这两位经营者的"共性"，而应该是大多数个体经营者的"共性"。如果事实真的是这样，有能力去经营旅游的牧民将会是非常有限的。考虑到牧民经营旅游获得客源的困难，这样的担忧，是有一定道理的。

通过比较还可以发现，诺尔布和包玉提供的旅游活动项目几乎一样：骑马、射箭、风味餐、自制奶食品，其就餐、住宿的条件和收费标准也很近似。实际上，缺乏经营特色可能也是造成除了通过关系难以解决客源问题的原因。如果所有的经营者都是如此，那么他们提供的服务可以认为是能够相互完全替代的。也就是说，如果有一家牧民能够提供非常新奇的受人欢迎的旅游项目，那么他应该可以以此吸引游客，而不一定有上述的社会关系。因此，经营特色、经营方式也是牧户旅游经营能否成功的关键。

4.2.3.3　牧户联营方式

到目前为止，笔者在保护区内只发现了一家采用牧户联营方式经营旅游的牧村——"奥奇"牧村。他们从 2000 年夏天开始经营，笔者到的时候，今年的旅游经营还没有开始，正在筹备当中。笔者分别对村长昭纳、参与经营的一位牧民（郝布斯哈利图）和租地给牧村的牧民进行了访谈，并观看了"奥奇"牧村接待游客的情形，从不同的角度观察"奥奇"牧村的运营机制。访谈的最终目的是比较联营方式与个体经营方式对于放牧的替代性，考察究竟哪一种方式更适宜在现阶段推广。因此，除了一些基本市场调查中所需的部分，如经营的规模、提供的活动项目、收费标准等内容之外，主要的关注点集中在牧民获得的收入和牧村经营可能达到的规模两方面。由于在联营方式中，"奥奇"牧村作为一个整体出现，访谈的不同对象也不具有一定的可比性，本研究把对于各个方面的访谈结果直接汇总，而不再分别列出。

"奥奇"牧村来源于 1997 年 9 月注册的"奥奇"民办研究所，主要研究草原文化、民俗旅游。它的成立，是为日后产生的"奥奇"牧村进行初步探索。除了所长昭纳，其他的研究人员都是应需要雇佣的兼职人员，无长期的雇佣合同。昭纳所长反复强调，"奥奇"研究所致力于开发具有民族特色的文化旅游，发扬牧民文化，如饮食文化、服饰文化等。并提出了"低风险、低成本、高利润"的发展目标。3 年的酝酿之后，"奥奇"牧村在 2000 年夏天开始营业，昭纳所长兼任"奥奇"牧村村长。

"奥奇"牧村采用"牧、草分离"的经营方式。选择位置条件适宜的草场，向牧民租用旅游季的使用权（一般为 2 个月）。牧民方面则由昭纳组织，他们自带蒙古包、马匹等组建"奥奇"牧村。牧村的主要工作包括：接待游客、表演歌舞、套马、烹饪，对于牧民来说，完成这些工作不需要任何特殊的技能。18 人之间属于"救火式"的分工，也就是基本上没有分工，什么工作需要人手，大家就一起去做。而指挥日常工作的责任，和对所有人员的管理、

收入分配,以至"奥奇"牧村对外联系和发展战略,都由昭纳 1 人负责。2000 年经营之前,"奥奇"研究所与牧户之间无任何收入分配方面的契约。笔者进行访谈的时候,获悉 2001 年的收入分配合同正在拟定当中。

2000 年 4 户牧民共计 18 人组成了"奥奇"牧村,共有 18 顶蒙古包,可容纳 60 人～70 人住宿。2 个月中,共接待游客 2500 人。"奥奇"牧村提供的活动项目和收费如下:蒙古礼仪迎宾(200 元/场)、马队迎宾(300 元/场)、民族歌舞表演(500 元/场)、赛马表演(120 元/场)、套马表演(300 元/场)。住宿 30 元/人,风味餐 40 元/人。

"奥奇"牧村的客源主要来自 3 个方向:旅行社、机关单位和一些慕名而来的散客。据了解,昭纳退休之前曾在政府机关工作,相信在吸引客源方面,他的社会关系起到了相当的作用。

2000 年"奥奇"牧村的收入约为 3 万元左右。牧民依照参加的劳动力数量不同和投入的蒙古包、奶牛、马匹数量不同,按户获得由几百元至几千元不等的报酬。打零工的牧民一般按 300 元/月～400 元/月计薪,研究所没有直接参与分配。

4.2.4 两种牧户经营方式对畜牧业的替代性比较

从下面两方面来考察牧户个体经营和联营方式对放牧的替代性:为牧民带来的利润和可以达到的规模(能够达到的牧民参与数量)。

(1) 为牧民带来的利润

联营可以降低成本,获得更多的利润,形成通常所说的"规模经济"。这一点在联营的方式也有体现。首先,联营可以降低每户牧民经营旅游的初始投资,第二,联营以后,对外宣传由村长昭纳负责,牧民无须为客源担心。而作为一个牧村在广告宣传和与旅行社的接触中,都比个体户经营的牧户醒目和有说服力得多。观察笔者已经得到的数据,诺尔布和包玉年接待游客的人次数大约为 500 人次～1 000 人次,获利 10 000 元,"奥奇"牧村年接待 2 500 人次,获利 40 000 元。从这个角度,联营可以获得更高的利润。

但是,相比较的是牧户从经营旅游中获得的收入,而牧民个体经营中所有的利润即为其经营旅游的收入,因此牧村的收入分配方式至关重要。

(2) 扩大规模所受的制约

一个牧村可能达到的规模,与牧村管理者的水平密切相关;究竟能出现多少个牧村,也受高水平管理者的数量的影响。

在调查中发现,"奥奇"牧村的管理还有待走上正轨。具体上讲,缺乏明确的分工,没有有效的激励机制和奖惩办法,使得牧村在经营中难以达到高效率的运转;牧村在管理层上只有村长昭纳一人身兼数职,只适用于目前牧村规模不大的情况下,一旦牧村经营规模扩大,则需要更多的、更有效的管理人员。缺少一批高水平的管理者,是扩大牧村经营规模、增加牧村数量的最大困难。

对于个体经营者来说,最大的制约是客源。调查过程中,有很多牧民表示也想要经营旅游,但"拉不上关系",担心没有客源。另外一点是资金,经营旅游所需的启动资金也限制了牧民经营旅游。

表 4-6 总结了两种经营方式在替代性方面进行的比较。可以发现，两种方式各有利弊。牧民个体经营旅游缺少启动资金和客源，但不存在收入分配的问题，也不需要高水平的组织管理经营人员。牧户联营对于那些缺少启动资金的牧户比较有意义，可以通过与那些较富裕户的联营，参与旅游的经营，但是牧户联营需要基于一种公平的运行机制，也需要较高水平的管理者。

表 4-6　牧户联营和个体经营方式的比较

	牧户联营方式（奥奇）	个体牧户经营方式
扩大规模的需要的条件	缺少一定的管理、协调机制	缺少启动资金和客源
牧民可以获得的收入	取决于分配机制	全部收入归自己，较明确

4.2.5　讨论与建议

经过调查和比较，可以发现在保护区内旅游市场上 3 种主要的经营方式中，非牧户经营的度假村占规模和效益的绝大多数，牧民从中受益的比例微乎其微，大多数经济收益都流出了该地区；牧户个体经营和联营的方式，能够较好地体现牧户参与并从旅游受益的生态旅游的宗旨，但目前规模太小，需要政府及有关管理部门的扶持。

通过以上分析和讨论，对保护区内社区如何参与旅游并受益，提出以下建议：

（1）通过宣传培训，提高牧民市场经济的意识和相关的技能。蒙古族人民传统上待客热情淳朴，但是缺少必要的市场经济头脑，不善于经营。因此，保护区应通过多种渠道，进行有关旅游经营知识、技能的宣传和培训，并提供必要的信息。

（2）利用多种渠道帮助牧户解决启动资金问题。包括政府拨款，如从国家的西部旅游开发的资金中拿出较少一部分来支持牧户旅游开发；帮助牧户从银行贷款；利用多方渠道从国际组织、民间组织引进资金等。

（3）政府管理部门通过发放旅游经营许可证，优先保证当地社区居民经营权，以加大社区的参与程度，充分带动社区的经济发展。采取措施保证当地社区的旅游经营权，并不意味着排斥其他外来的经营者，因为当地经营者往往缺少经验，因此需要相关知识的培训。只有与外来经营者合作，可以获得这种知识和经验。通过适当的合作，当地经营者在获得最大经济利益的同时，可以减少经济、社会、文化成本。

（4）在有关政策上鼓励旅游经营单位优先吸纳当地社区居民，解决当地劳动力的就业问题。如通过降低税收等办法，鼓励支持旅游经营单位吸纳更多的当地牧民从事旅游工作，使更多的牧民从依靠单一畜牧业为生，转为利用生态旅游间接利用资源，从而更好地保护环境。

（5）拓宽牧民参与旅游经营的多种途径。真正经营旅游度假村，无论是个体经营还是参与联营，都需要一定的经济实力，不是每家牧民都可以承受的。而且，尽管目前而言保护区内的旅游市场还大有可为，但是作为一个单一的市场，其容量毕竟是有限的。旅游业的发展，通常具有相当的带动作用，可以直接或间接的带动其他市场。因此，开发牧民参与旅游经营的其他途径，使牧民最大限度地参与到旅游经营当中去，是十分有必要的。

事实上，牧民的服饰、装饰品，甚至一些生活、生产中的普通用具，在游客眼中都是很有情趣的纪念品。如果能在经营中注意开发自己的纪念品销售市场，相信可以获得可观的收入。

锡盟具有蒙古族特色的奶食品，是旅游饮食中的重头戏。但是只有很少的几种被制成便携的包装，供游客购买。牧民们几乎家家都制作奶食品，如果可以将这些奶食品简单处理对游客销售，市场前景也是很好的。

目前，各个度假村和牧民经营旅游的主要收入都来自于住宿和饮食，提供的有草原特色的娱乐活动相对比较少。奥奇牧村在这方面做的比较突出，它为游客提供了很丰富的草原活动，如蒙古族的欢迎仪式，但基本上是免费的。因此，锡盟在草原游乐活动方面还没有形成一个稳定的价格体系。由于这些具有民族风情的旅游营业项目对于游客具有很大的吸引力，尽快建立这样的价格体系，从中获得收入也是牧民参与旅游经营获利的途径之一。

(6) 加强旅游市场宣传，帮助扩大客源。如上述专栏描述的 2 户经营旅游的牧户，都是在客源有一定的保证下，才开展个体经营旅游的。而对于一般的牧户，在旅游开展初期，则需要依靠当地政府和相关部门进行旅游的宣传，以保证客源市场。

4.3　保护区在生态旅游管理中的职能及作用

通过以上分析，阐述了锡林郭勒生物圈保护区内开展生态旅游对自然资源保护和经济可持续发展的必要性、可行性，及社区参与并从中受益的建议。然而，生态旅游与传统旅游最大的不同是需要在高度严格、科学的管理下运行，才能达到环境、经济、社区、游客四方面同时受益。因此，如何发挥保护区的管理职能，充分利用生物圈保护区的理念对保护区内的旅游经营活动进行检查、监督和管理，是保护区旅游走上可持续发展之路的关键。以下首先分析保护区开展生态旅游现状；根据调查分析目前在管理上存在的问题；最后对锡林郭勒生物圈保护区如何在生态旅游中发挥管理、监督的职能提出建议。

4.3.1　保护区生态旅游发展现状

锡林郭勒草原旅游业作为一个产业是从 1997 年—1998 年才开始，这主要表现在 2 个方面：一是从宏观来讲，锡林郭勒盟旅游局从 1997 年开始把旅游业当作一个产业并统计其产业收入；二是从微观来讲，1998 年开始牧民认为光靠牧业不行，需多种经营，同时可以宣传地区，弘扬民族文化，所以在保障牧业的前提下，开始正式经营旅游业。目前，保护区范围内有旅游度假村共有 40 家，其中形成规模的有 15 家；旅行社 4 家；民族工艺品经销店 8 家(定点)，加上度假村、综合商店连带经营的有 10 多家。旅游基础设施方面，锡林浩特市内星级宾馆 4 家，床位数 625 张；定点涉外宾馆 5 家，床位数 481 张；一般旅馆 41 家，床位数 1 455 张。市内注册出租车 3 800 辆。

下面通过保护区旅游经营的收入构成和游客的消费结构，来分析保护区内旅游业发展的特点和存在的问题。

据统计计算，2000 年保护区旅游业总收入为 7 930 万元，主要包括 3 个部分：一是位于锡林浩特市的星级、涉外宾馆的餐饮、住宿收入（2 552 万元）；二是牧区度假村收入（378 万元）；三是市区旅游纪念品销售收入（5 000 万元）。图 4-2 表明 2000 年保护区范围内旅游收入的构成，其中 63%来自于旅游纪念品销售，32%来自于市区宾馆饭店，只有 5%来自于牧区的度假村。这表明，虽然草原作为最大的旅游资源吸引了游客，但 95%的的旅游收入并没有留在草原上的牧区，而是流转到城市里。

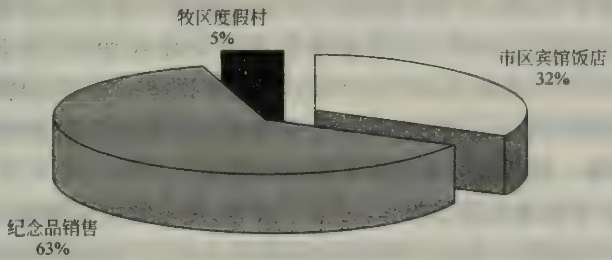

图 4-2 保护区内 2000 年旅游经营收入构成

旅游的 6 个方面：吃、住、行、游玩、娱乐、购物中，吃、住和购物 3 方面，尤其是购物，几乎构成了所得的全部总收入，“行”的内容我们这里未做统计，而游玩和娱乐两方面的收入几乎为零。由于草原旅游的基本特点是景点分散，再加上交通不便、度假村基础设施不完善，形成了现在锡林郭勒草原旅游的方式：以锡林浩特市为大本营，主要的吃和住两方面支出在市里，白天去度假村玩，匆匆欣赏过草原美景后，饱尝一顿蒙古特色的午餐，赶回市里。很明显，目前这种旅游方式并不适合草原旅游。由于 1 天的时间有限，游客不能走到离市区很远的地方，也就无法真正欣赏到草原的自然美景；游客在度假村停留的时间很短，无法消费度假村许多其他旅游产品如篝火晚会、搭蒙古包表演等，更无法了解蒙古族生活方式和特色产品的制作过程。

从上述数据，我们可以看出牧区度假村旅游经营对保护区整个旅游业的贡献是 5%（378 / 7 930），且度假村收入主要来自于餐饮，而展示和参与蒙古族特有民族文化和生活习俗的“精神产品”却不创造收入。如奥奇牧村，其服务项目丰富多样，2000 年游客达 2 500 人，经营收入是 9 万，平均每人消费金额是 36 元，盟旅游局规定对游客收费是每人每餐 50 元，由此可见，奥奇牧村的旅游业收入几乎全部是餐饮收入，而其他介绍蒙古族风俗文化的产品如蒙古族的欢迎仪式、骑马等几乎是免费的。草原旅游，对大多数旅游者来说，最具吸引力的是广阔的草原美景、淳朴的蒙古族人民的文化及其生活方式、骑着骏马奔驰在草原上的感觉和蒙古族特有的各种食品及其制作过程等，现在针对这些需求的产品寥寥无几，即使有类似产品，也没有形成合理的定价体系，从中获得收入。

通过以上分析，可以看出保护区的旅游业还处在其发展的最初阶段，表现在以下几个方面：保护区旅游业总收入只占锡林浩特市 GDP 的 4%，还未形成规模；现有旅游业收入主要来自吃、住，旅游产品的开发具有很大潜力；由于度假村承包经营者所签合同期限大多在 1 年，使得度假村经营很不稳定；牧户参与旅游业的渠道没有建立，一是由于缺少统一组织者，二是牧户缺少资金。

虽然现在保护区旅游业仍处于其发展的最初阶段，但也初步显现了旅游业对当地经济和环境保护的好处，主要体现在以下几方面：

旅游业需求的羊、奶制品等基本从当地来，增加当地产品附加值，2000 年保护区内 13 个旅游点共消费 3 160 只羊，制作成手扒羊、烤全羊等各种特色食品提供给游客，按每只羊 600 元计算，这一部分收入为：600 元 /只×3 160 只＝189.60 万元；此外，奶制品销售收入近 60 万元。两项总和为 249.60 万元。

就业方面，旅游中吃、住、行、游、娱、购六方面都需要大量劳动力，且多数岗位没有太高的技术要求。保护区主要的 10 多家度假村平均雇佣职工 21 名，平均月工资是 300 元～400 元，这 3 个月的收入对于一个牧户家庭来说是一笔不小的数目。尤其是对于牧户经营的旅游度假村来说，6 月底至 9 月正是畜牧业的劳动力需求淡季，能在这 3 个月时间通过旅游服务赚一部分收入是大多数牧民的愿望。

思想文化方面，牧民通过接待游客，开拓了眼界，现在牧民个体或几户联营旅游业的发展，体现了牧民市场意识的提高，把传统的民族文化开发为旅游产品，在发扬民族文化的同时，还保证了一定的经济收入。

环境保护方面，旅游业的初步发展尤其是牧民个体或联营的发展，保证了牧民一定的收入，可以部分弥补牲畜减少的收入损失，同时也减轻了畜牧业对草原的压力；虽然保护区管理局没有加入到当地旅游业的发展进程中，但我们相信，只要将保护区草原生态环境方面的知识与旅游结合起来，必将通过提高游客的环境意识进而为提高国民的环境保护意识做出贡献。

4.3.2 旅游的管理现状及存在的问题

草原旅游与环境关系密切，草场退化带来的后果最终将是游客数量的下降和旅游收益的减少，因此锡林郭勒草原旅游的管理尤其重要。在旅游的公众宣传教育方面，保护区比较重视。1999 年在扎格斯台湖畔建造了占地 600 平方米的宣传教育展示厅，参观学习的人员主要是区内外游客，而其中当地社区居民和中小学生比重也有很大提高。同时保护区也印制了保护区宣传图片和管理条例向当地居民和游客发放。

但是由于种种原因（土地权属问题、保护区自身运行体制问题等，见本书其他有关章节），保护区在目前的旅游中并没有发挥应有的作用。体现在以下几方面：

(1) 无经营审批权。据调查，保护区范围内大大小小的旅游度假村有几十个。这些度假村在开业前办理旅游许可证时，必须经过工商、税务、旅游、卫生等部门批准，但是唯独最重要的资源管理部门——保护区管理局没有审批权。这些度假村是在保护区范围内经营，虽然保护区不拥有这些度假村所在地的土地权，但按照《中华人民共和国自然保护区管理条例》第二十九条，一切在保护区实验区范围内开展的参观、旅游活动，须由保护区管理机构提出方案，经省、自治区、直辖市人民政府有关自然保护区行政主管部门审核后，方可进行。但是，在锡林郭勒生物圈保护区内，由于保护区管理局无旅游审批权，因此对于自身管辖范围内具体有多少个旅游度假村及其相关旅游活动不甚清楚。而对度假村的调查表明，多数度假村的经营者不知道他们处于国家级保护区范围内，更不知道该地区也

是联合国教科文组织世界生物圈保护区。很多经营者只知道白音锡勒牧场部分是在保护区范围内,甚至称之为白音锡勒保护区,而对于包括整个锡林浩特市都处于保护区范围这一事实并不了解。

(2) 无规划审批权。对于整个保护区范围内旅游长期发展的规划,至今并没有一个完整的规划。锡林浩特市旅游局曾做过关于《锡林浩特市旅游规划》,也仅是从旅游经营角度出发,对旅游路线、经营等做的规划,而没有更多地考虑环境因素,保护区管理部门也没有参与规划的审批。由于种种原因,当地政府部门并没有意识到在保护区范围内的旅游应由保护区来管理、规划。2000 年国家在西部开发中拿出部分资金来支持西部旅游基础设施的建设,锡林郭勒草原生态旅游开发项目被列为全国 77 个受资助项目之一,盟里得到 800 万元的资助。锡林郭勒景点的旅游规划是由白音锡勒牧场做的,由于旅游规划没有竞争力,盟里仅从 800 万元中划拨 100 万元给白音锡勒牧场。而且,由于规划的欠缺,这 100 万元也没有带来应有的旅游经济效益。作为一个在保护区范围内的旅游项目,该规划应由景点土地所属部门白音锡勒牧场、自然保护区和市旅游局 3 家共同制定和审批。这样,由于业务部门的参与,至少不会出现上述缺少科学依据及旅游吸引力的规划的出台,而将有限的资金白白浪费。

(3) 无管理措施。由于无旅游经营和规划审批权,至今为止保护区对于其范围内的旅游路线、范围,以及旅游活动强度根本无法控制,更谈不上严密、科学的环境管理。旅游在带来经济利益的同时,不可避免也会对环境造成负面影响,它是一把名副其实的"双刃剑"。只有在科学有效的管理之下,才能最大发挥其有利的一面,避免或减少其不利的一面。

除了科学的旅游规划外,在日常管理中最重要就是针对旅游造成的环境影响进行环境监测。然而,保护区管理部门至今无任何针对旅游的环境影响监测制度和程序。草原上的旅游有其独特性,没有天然的沟壑或河流、山体作为游客活动范围的限制。因此对于如何防止游客过度践踏草场、采摘植物标本,在管理措施上尤其显得重要。以草原那达慕为例,每次那达慕之后,方圆几公里内的草场由于游客的践踏会出现裸露的沙地,而周围的鲜花及可食用野生植物也会被采摘殆尽。据当地管理人员介绍,早几年随处可见的草原独有的植物干枝梅,由于游客没有限制的采摘,目前在锡林郭勒草原的大多数地方已经看不见了。笔者在 2001 年 4 次赴锡林郭勒草原调查,竟没有见过一枝干枝梅的踪迹。

由于管理不善,旅游度假村的垃圾、污水处理等都处于无人管理监督的状态下。在调查过程中发现,多数度假村为了不影响自己景点的景观,会将日常垃圾在附近就地浅层填埋。由于草原风大,过了旅游季节后,常常会有浅埋的垃圾被风刮起的现象。另外,所有度假村的厕所污水都没有经过处理,直接排放至草原上。诸如此类的环境问题,在目前旅游处于初期发展阶段可能并不突出,但如不及早采取措施,最终将成为旅游进一步发展的障碍。

4.3.3 对保护区在旅游中发挥管理职能的建议

通过以上分析,对锡林郭勒生物圈保护区在旅游管理如何发挥其职能作用,提出以下

建议：

(1) 依法行使其旅游经营和规划的审批权。除了《中华人民共和国自然保护区条例》，锡林郭勒生物圈保护区于2001年由内蒙古自治区人大通过了《锡林郭勒草原保护区条例》，这两个条例在制度上保证了保护区管理部门在旅游经营和规划上的审批权。保护区应充分利用现有的条例，积极地行使其对自然资源的管理权。当然，要做到这一点，必须得到自治区、盟、市各级政府的支持和配合。

(2) 制定严格的管理措施。有了管理权以后，还需要制定严格的管理措施，来监督、管理旅游，使之达到可持续发展的目标。如制定日常旅游环境监测指标和监测程序，对旅游的环境影响做长期的跟踪监测，为今后旅游规划调整提供依据；制定针对游客的游人服务和管理措施；建立社区参与保障体系和管理制度；制定针对经营者的管理措施等等。

(3) 充分发挥自己的优势，为保护区内的旅游提供服务。保护区在旅游管理方面有着自己特有的优势。表现在以下几方面：自然资源是一个国家的公共财产，保护区管理部门本身就是自然资源的管理者，代表着国家利益，因此本身的角色定位决定了其能够公正地从资源保护的角度管理所辖范围的旅游活动；保护区内的生态旅游最终目的是为了使该地区的经济和环境可持续发展，而世界与生物圈保护区管理的思想理念，就是要通过保护区内资源的可持续利用来带动和促进当地社区的经济发展，最终达到资源保护的目的，因此从管理思想上而言，保护区管理部门是该地区最适合管理旅游的部门；保护区日常的管理工作，如对生物种群的本底监测、对自然资源保护的公众宣传等，与生态旅游所需要的管理工作非常接近，因此从管理工作的具体操作上，保护区管理部门也具有其他部门所不具备的优势。

保护区应充分发挥自己的这些优势，在担负起管理职责的同时，积极主动地对保护区范围内的旅游提供相应服务。首先，可以利用联合国教科文世界生物圈这块国际品牌，加大宣传力度，提高该保护区在旅游景点中的知名度，如对于那些符合生态旅游规范的度假村，通过某种检查、监督机制，帮助指导他们使用世界生物圈的标志进行宣传；对于牧民进行有关旅游知识、技能的培训，帮助他们从思想上克服对旅游经营的畏难、恐惧心理；保护区近年来对外交往日益频繁，如与澳大利亚 Bookmark 保护区结为秭妹保护区，因此可以经常举办一些讲座，介绍国外生态旅游经营和管理的先进经验；利用保护区自身的科研优势，以及与中科院草原定位站的长期合作关系，进行生态旅游的科普知识宣传；利用与保护区合作的科研院所、大专院校的关系和渠道，帮助解决旅游中遇到的有关实际问题，如寻找适合草原干旱缺水环境下使用的生态厕所、费用低廉处理效果达标的污水处理系统等；如有可能，帮助牧户寻求旅游的启动资金等。只要一切从当地社区群众的利益出发，相信保护区会从旅游管理中重新树立自身的形象，并最终达到资源保护的目的。

第 5 章

锡林浩特城市与生物圈保护区的相互关系

5.1 问题的提出

自然与自然保护的理念在中国有着悠久的历史，中国的古代先哲如老子、庄子、荀子、孔子以及孟子等都是强调自然哲学观的（哲学大词典编辑委员会 1985）。他们传统的“天人合一”观念强调天道与人道、自然与人为相通、相类和统一，他们反对人与天相互敌对的观点，讲求天与人的和谐。如《易 ·乾卦 ·文言》指出“大人者与天地合其德，与日月合其明，与四时合其序，与鬼神合其吉凶，先天而天弗违，后天而奉天时”；庄子有“天地与我并生，而万物与我为一”（《庄子 ·齐物论》）的呼唤，反对因人的主观区分，而破坏了天与人统一的做法。认为自然是“天然耳，非为也，故以天言之，所以明其自然也，岂苍苍之谓哉！”（《庄子 ·齐物论》）。只有自然界才是最美好的，“天地有大美而不言”（《庄子 ·知北游》）。老子有“天地任自然，无为无造，万物自相治理，故不仁也”（《老子注 ·五章》）；“人法地，地法天，天法道，道法自然”（《老子二十五章》）。荀子认为四时运行，百物生养，是自然的职能，“不为而成，不求而得，夫是之谓天职”。正是由于自然的职能和功效，人才具备了形体，精神也随之而产生，“天职既立，天功既成，形具而神生”（《荀子 ·天论》）。在对自然资源利用的态度上，孔子有“钓而不纲，戈不射宿”的思想（《论语 ·述而》）；孟子则对自然保护与利用有类似今天生物圈保护区的雏形，“文王之囿方七十里，刍荛者往焉，雉兔者往焉，与民同之”（《孟子 ·梁惠王章句下》）（中国传统文化读本编纂委员会 1995 a; b）。

如果同历史上的古代先哲的天然或自然观点相比，则今天的自然保护区事业是迫不得已的。由于科学技术的进步尤其工业革命以来的环境问题的日益加剧，大面积的自然生态系统受到来自人为的威胁，人与天严重对立。有识之士强烈呼吁人类保护自然和回归自然。19 世纪下半叶，西方国家开始建立庄园式的保护区，随后自然保护区在世界各地出现。中国在封建统治时期，一些皇家禁地都是严格意义上的保护区，但它们只是仅为皇室成员服务的。实际上现代意义上的自然保护区在中国大地上出现，则是于 1956 年由

中国科学院在广东省建立的鼎湖山自然保护区，随后于1972年中国参加了MAB（Man and the Biosphere 人与生物圈）计划，引入了人与生物圈概念。1978年以后自然保护区建设进入了一个新高潮，1984年加入第一个世界人与生物圈保护区，1987年成立中国自己的"中国生物圈保护区网络"（CBRN）。截止到目前为止，我国共有各类自然保护区1 276个，其中国家级155个，占国土面积的12.44%，其中世界生物圈保护区网络成员21个。这些保护区的建立从战略意义上来看，旨在保护中国不同类型的生态系统、促进生物多样性的就地保护、改善国家整体生态环境状况、促进当地社区发展，无疑是非常重大的举措，是既造福于当代又给子孙后代留下宝贵自然遗产的"积德"事业。但是，目前自然保护区的建设与管理存在着不少制约性的因素和困难，影响着自然保护区的发展。除了众所周知的经费问题外，正确处理好保护与发展的矛盾是自然保护区面临的最主要问题。

在社区发展中城市或城镇的作用非常重要，是解决自然保护中人口压力的最有效途径。虽然目前国内的大部分自然保护区保护了相对完整的生态系统，但普遍存在的低效益、高破坏性的社区发展模式（陡坡开垦、过度放牧、围湖围海造田、竭泽而渔）造成自然生态系统的大规模退化，造成了严重的生态环境问题，如黄河断流、长江洪水泛滥、荒漠化扩大、沙尘暴频次加大、水土流失、病虫害爆发、山体滑坡、泥石流、干旱化严重等等（国家环境保护局自然保护司 2000）。为此，国家被迫在很多地区实施天然林保护工程、退耕还林还草工程、自然保护区工程等。但是无论这些工程如何有效，如果没有考虑到社区群众（尤其广大的农、牧、渔民），这些生态环境治理的工程最终也得以失败而告终。在解决自然保护面临的社区与人口压力方面，生态城市与生态城镇化建设具有很大的潜力。

城市与城镇是人口集中的结果，是一个地区政治、经济、商住、交通、教育、文化、信息等中心，城市化程度大小是国家和地区是否发达的标志。其实，城市化概念早在东周时期就有所体现，例如在公元前350年（周显王十九年）著名的商鞅变法中，就有"集小都乡邑聚为县"的倡议（《商君书》）（哲学大词典编辑委员会 1985）。目前中国的城镇化约为40%左右，而发达国家为70%～80%。针对因人口分散和低效率利用土地资源的做法，在中国的大部分土地退化地区，尤其自然保护区实施城市与城镇化建设可能是一条重要的途径。国际上，联合国教科文组织人与生物圈计划于2000年将生物圈保护区概念引入到城市，其初衷就是解决城市社会和经济发展问题，但是具体怎么做到目前为止还没有成功的模式，非常有必要加强研究城市与保护区关系的研究。在中国一些自然保护区，城市化或城镇化问题实际上已经成为不容忽视的现实，如新疆的博格达自然保护区，阜康市就位于其中；内蒙古锡林郭勒生物圈保护区中锡林浩特也位于其过渡区中，另外浙江天目山和四川九寨沟生物圈保护区，则因生态旅游的迅速发展，在保护区周围发展起了生态小城镇。锡林郭勒保护区于1985年正式建立，1987年被联合国教科文组织吸收为国际生物圈保护区成员，1995年与澳大利亚 Bookmark 保护区结对成立姊妹保护区。该保护区面积10 786 km^2，其中包括了牧场、渔场、林场、城镇与城市，人口有13.4万人（锡林郭勒国家级草原自然保护区管理局 1999）。从战略意义上看，这种设计是带前瞻性的，但存在的问题也非常多，如保护区基本没有核心区（仅占保护区总面积的0.17%）、草原生态系统退化，社区发展举步维艰。其中城市、城镇的发展与保护区根本脱节，双方都没有考虑

到互相作用的机制。因此非常有必要对自然保护区与城市(镇)关系开展具体的剖析,发现存在的问题,寻找解决的途径。本研究涉及的具体内容有:① 锡林郭勒生物圈保护区中城市的性质与定位;② 锡林浩特市在锡林郭勒生物圈保护区可持续发展中功能;③ 城镇在锡林郭勒生物圈保护区可持续发展中功能:以白音锡勒镇为例;④ 锡林郭勒生物圈保护区在促进城市与城镇发展中的作用;⑤ 城镇与城市对退化类型自然保护区生态恢复中的重要作用。下面是一些初步的研究结果,供有关单位参考。

5.2 锡林郭勒生物圈保护区中的城市性质与定位

5.2.1 锡林浩特市

锡林浩特城市的发展历史是随着锡林郭勒盟的历史沿革而变化的。这里人类活动的足迹可以追溯到旧时器时代,后演化成为被史家称为匈奴的北方游牧民族。春秋战国时期为东胡所居住;秦汉时期南部为上谷郡北境,大部为匈奴、鲜卑;三国时期,为鲜卑、乌洛侯、契丹部居住;隋唐时期为突厥、库莫奚部据有。辽为上京道西北境,金为西京路恒州管辖;元代属岭引省上都路,应昌所管辖;明代属元太祖成吉思汗弟别古代 17 世孙诺必特默克图的游牧地,亦号所部为阿巴嘎纳尔。后来的锡林浩特城市就在此基础上建立,后经过清、中华民国、中华人民共和国不同时期,形成了今天的规模。锡林,蒙古语为丘陵,浩特为城,因此其名称是以境内的丘陵而命名的。在城市的创建时期,有一个重要的事件值得注意,这就是贝子庙的建立。清康熙六年 (1667)编右翼旗(相当于内地的县),包楞莫尔根封爵为扎萨克罗贝勒王,其子孙承袭贝勒爵位共 12 世孙,最后的贝勒王为汪钦敦德布;包楞莫尔根之堂弟董伊斯日布被封爵为扎萨克多罗贝子王,其子孙承袭贝子爵位共 10 世孙,最后的贝子王为仁其道尔吉。乾隆八年 (1743)建贝子庙,标志着城市的建立(锡林郭勒盟志编纂委员会 1996;锡林郭勒盟商业志编纂委员会 1996)。因此,锡林浩特城市实际上只有 260 年的历史。

锡林浩特市 (N 43°02′～44°52′, E 115°13′～117°06′, 海拔 988m)位于锡林郭勒生物圈保护区内,四周为保护区所包围,因此是位于保护区中的城市。同时,锡林浩特市也位于锡林郭勒盟的中心位置,是盟公署的所在地。东与西乌珠穆沁旗相邻,西依阿巴嘎旗,南与正蓝旗接壤,北与东乌珠穆沁旗为邻。

站在全自治区和全国的角度来看锡林浩特市,她是全国优先发展的 70 家旅游城市之一。这里有全自治区四大名庙之一的贝子庙 (另外三个为百灵庙、协拉木伦庙、五当召),有全自治区五大草原之首的锡林郭勒草原(另四个草原为呼伦贝尔、乌兰察布、鄂尔多斯、科尔沁),有自治区六大煤田之一的乌兰图嘎煤田。因此,这里有很明显的自然资源和生态旅游资源,有很明显的发展替代产业的优势。但同时锡林郭勒草原面临着严重的草原退化,退化程度达 81.7%。草原的退化造成了严重的沙尘暴,直接影响了首都北京及华北地区的生态安全,以及 2008 年奥运会的成功举办,因此,这里面临着非常急迫的退化草原生态系统恢复任务。

从以上的分析来看,锡林浩特城市宜定位于:

第一，是位于保护区中的城市，是草原城市。城市的发展要充分考虑到锡林郭勒生物圈保护区的功能。

第二，是全国优先发展的旅游城市之一，锡林郭勒所在的草原属于全自治区5大王牌旅游区之一，而锡林浩特城市是其核心，旅游产业发展依赖生物圈保护区保护效果和生态环境的质量。

第三，是环京津地区特殊生态功能区的重要城市，对整个保护区甚至全盟的生态经济建设起关键的作用，她的功能重点体现在锡林郭勒生物圈保护区的过渡区。其生态恢复的效果在整个草地类型退化生态系统中有非常重要的示范作用。整个城市的发展应当充分考虑到这一具有重要战略意义的特殊功能。

5.2.2 白音锡勒镇

相对于锡林浩特市而言，白音锡勒镇的历史则短的多，它是于20世纪60年代在白音锡勒牧场的基础上建立起来的，当时的人口约2 300人，1970年很快发展到10 000人，目前人口10 210人。但是，从严格意义上规划城镇，则是最近1年～2年的事情。即使如此，她的发展仍然比锡林郭勒生物圈保护区的历史要长，锡林郭勒生物圈保护区成立的时间是1985年。在保护区初成立时，一些办公机构是挂靠在白音锡勒牧场的。白音锡勒镇（当时为牧场，县团级）实际上在某种程度上行使了保护区的职能，但是它代表的只是企业。目前，在白音锡勒镇约有5 000人在镇里分布，占总牧场人数的50%左右。规划的城镇面积3 km^2。目前的白音锡勒镇基本上具备了现代化小城镇的规模：有政府管理机关和事业单位（锡林浩特市政府的派出单位）6家；邮电邮政与电信两家，建立了50 km的光缆线；交通设施齐全，有小公共、专线汽车、出租车直通锡林浩特市；有旅馆（宾馆与招待所）和饭店多家；有2所学校（小学）、白音锡勒农工企业医院、有自己的旅游点、各种工厂（畜产加工，萤石矿，饲料加工厂）等。

白音锡勒镇位于锡林郭勒生物圈保护区的核心区附近，与保护区关系密切。面临着主要问题是大面积的草地退化，对自然资源的利用为低效率的粗放的掠夺式利用，社区发展模式急需调整，需要同锡林郭勒生物圈保护区核心区扩大同步进行规划，逐步恢复真正意义上的欧亚大陆典型草原景观，使之成为既可以利用，又可以欣赏的可持续的生态系统。逐步规划建设生态小城镇，争取列入全国的试点，建设有草原风格的生态小城镇。

从以上的分析看，白音锡勒镇的性质和定位表现在：

第一，是位于锡林郭勒生物圈保护区核心区附近的具有蒙古特色的小城镇，她的发展应当与保护区的社区发展协同进行。

第二，是实现锡林郭勒生物圈保护区退化生态系统恢复的重要城镇，在“以地养地”与“生态移民”治理沙地草地类型草原生态系统退化模式中，吸引保护区核心区的人口，保障生物圈保护区中的大部分土地尤其是核心区及其周围退化土地得以“借助自然力自然恢复”，从而使核心区扩大。

第三，为生态旅游、集约化畜牧业、加工业、运输业等保护区社区生态与生产耦合模式提供基地，促进锡林郭勒生物圈保护区的生态、经济与社会的可持续发展。

5.2.3　生物圈保护区中城市与城镇应体现的生态内容

围绕着上述城市(镇)性质定位，在具体的城市建设，尤其是生态城市规划建设中，下述生态内容必须在生物圈保护区的城市体现出来，这对于地区的生态旅游发展、社区建设、生态功能的实现具有非常重要的意义：

(1) 在生态上是健康的，由于工业、生活、交通、人为活动造成的环境污染应得到控制，使其对城市人群的危害最小。工业发展应发展那些有草原特色的生态型产品，环境污染物质实现零排放。

(2) 城市生态系统的初级生产者应尽量体现城市本身或周围地区自然的方面，具体到锡林浩特，应发展有天然特色的各类有欣赏价值的草原草本植物群落，而不是北方的树木。

(3) 一些生态学的基本理论如生态平衡、生态恢复、生态系统等应在城市规划与建设中得以体现。

(4) 城市中的生物与人类和平共处，生物多样性尽量丰富，一些标志性的生态系统类型在城市中存在并得到保护，如羊草 (*Leymus chinensis*)、大针茅 (*Stipa grandis*)、冷蒿 (*Artemisia frigida*)、麻花头(*Serratuia centauroides*) 等组成的欧亚大陆典型草原生态系统；以黄花(*Hemerocallis cittrina*)、野罂粟(*Papaver nudicaule*)、干枝梅(*Limonium bicolor*)、金露梅(*Potentilla fruticosa*)、银露梅(*Potentilla glabra*)、地榆(*Sanguisorba officinalis*)等植物组成的五花草甸等。

(5) 城市生态规划是指按照生态学原理设计城市，进行功能区划分，在规划中尽量体现生态的内容，城市工业、经济、社会、文化的发展都要考虑到人与生态的协调。

5.3　城市与城镇对生物圈保护区的功能

5.3.1　对保护区人口压力的缓解作用

对于锡林郭勒生物圈保护区而言，锡林浩特市这个核心城市的工业、商业、矿业、能源、牧业、畜产品加工、生态旅游、文化、教育等经济与社会环境的发展状况，在很大程度上决定了保护区的保护状态。它的建城区面积只有 18.7 km^2，只有总土地面积的 0.17%；但聚集了人口 124 000 人，占总保护区人口(134 000 人)的 92% (锡林郭勒盟年鉴编纂委员会和锡盟党史地方志办公室年鉴编辑部 2000)。即是说城市用了着重对生物圈不同区域的结构和功能进行系统研究，并预测人类活动引起的生物圈及其资源的变化，及这种变化对人类本身的影响。为合理利用和保护生物圈的资源，保存遗传基因的多样性，改善人类同环境的关系，提供科学依据和理论基础，通过培训、示范、信息传播等方式，提高人类对生物圈的有效管理能力，以寻找有效地解决人口、资源、环境等问题的途径。0.2%的土地养育 92%以上的生物圈保护区人口。且这部分人口是高素质的，对生物圈保护区生态环境的改善起非常重要的作用。白音锡勒镇 5 000 人在镇里分布，占镇总人口的

50%，而其规划面积仅 3 km²，占镇总土地面积的 0.08%。在各种土地使用功能上，城镇是用地最少、而容纳人口最多的，在整个锡林郭勒盟城镇用地占总土地面积的比例变化于 0.04%～4.54%（含矿山占地）（表 5-1），但所容纳的人口则为本地人口的 30%～92%。

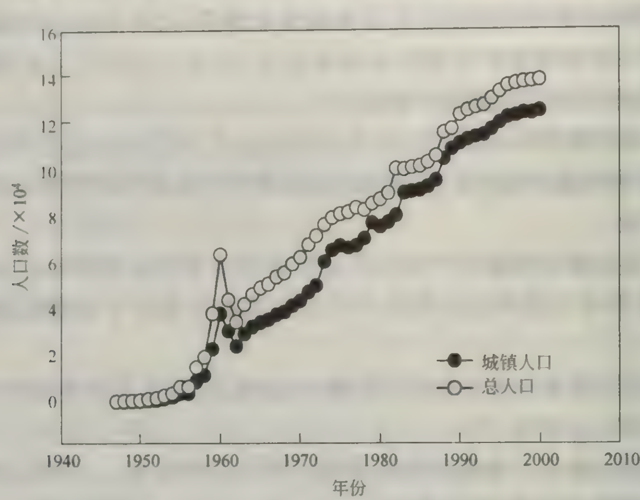

图 5-1　保护区总人口及城镇人口变化趋势（1947—2000）

表 5-1　锡林郭勒盟（锡林郭勒生物圈所在地）土地利用格局　单位：km²

地区	草地	农田	林地	水体	交通	城镇	总面积	城镇占地比/%
阿巴嘎	26 885.10	8.16	100.68	42.081	23.22	57.03	27 594	0.21
多伦	2 421.95	934.19	335.12	16.71	22.43	42.60	3 773	1.13
西苏旗	46 600	211.95	282.8	356.08	59.45	43.01	47 554	0.09
苏尼特左旗	33 147.75	2.53	110.36	171.01	25.41	11.94	33 469	0.04
苏尼特右旗	26 330.81	99.99	2.02	91.94	29.07	126.17	27 815.55	4.54
太仆寺旗	1 751.99	1 403.89	120.57	45.69	34.58	58.28	3 415	1.71
西乌珠穆	21 669	55.84	1 050.80	96.83	32.81	55.01	22 960	0.24
镶黄旗	4 877.73	21.74	21.20	17.14	7.23	14.96	4 960	0.30
锡林浩特市	15 466.97	169.78	15.05	40.53	29.80	35.75	16 079.64	2.22
正兰旗	9 009.71	277.90	489.70	132.93	24.38	28.38	9 963	0.28
镶白旗	5 633.39	266.34	106.83	38.15	11.59	26.70	6 083	0.44

因此城市与城镇是集中人口最好的途径，这在草地类型的退化生态系统恢复中表现的尤其重要。锡林郭勒天然草地中，因人口和牲畜增加造成的土地退化几乎使草地到达了崩溃的边缘，设若城市的人口重新分散到退化的草地中，重新放养没有限制数量的牲畜！那么，草原的全面退化可能提前 20 年就完成了；相反，如果分散在草原上极具破坏力的人群向城市（镇）集中，走生态与生产结合的路子，那么，草地的压力自然可以减少下来，退化草地可以在自然力的呵护下得以自然恢复。关于这一点，下面还要讨论。

5.3.2　核心区扩大的重要出路

虽然锡林郭勒生物圈保护区有号称 10 786 km^2的保护区面积，但实际上她的核心区是很小的，是分散在大面积草原背景下的 5 个点，而其中有 2 个点保护的不是典型的草原生态系统，而是片段化的森林群落，但恰是这两个点保护区作为核心保护的对象向外宣传。这显然是与建立保护区的初衷“保护在半干旱气候条件下发育在栗钙土上的典型草原生态系统和半湿润气候条件下发育在黑钙土上的草甸草原生态系统”不协调的（锡林郭勒国家级草原自然保护区管理局 1999）。现在 5 个点的面积加起来才 18.5 km^2，仅占保护区面积的 0.17%，因此，非常有必要按照保护区设计的初衷扩大核心区。在这方面，如果将位于海流特草原上的约 300 km^2的比较接近天然的划进核心区，则可使核心区面积扩大到原来的 15 倍，使整个核心区面积占全部保护区面积的 3%左右，这是比较合理的一个比例。但目前的问题是海流特草原上有牧户 70 余户，分别来自白音锡勒牧场和相邻的西乌苏旗。大部分为分散的住户，从事非常原始的放牧活动，草地的利用效率很低。主要依靠天然草场和头数畜牧业。且大部分牧户生活贫困，交通不便，文化生活落后，缺乏与外界的沟通，社区的生活质量极差。调查某牧户发现，该户原有 11 口人，有 9 个孩子(3 男 6 女)，其中 1 个女儿为弱智，出嫁后又带回 1 个弱智儿，使孩子的数量增加到 10 人，加上 2 个大人，共 12 口。生活非常困难，主要靠救济粮过日子。更重要的是精神生活方面的问题，大部分成员为文盲，文化生活异常单调，主要靠酒精麻醉神经而已。他们甚至怀念“文化大革命”的时代，那时至少有一些令人激动的“革命”活动。类似这样的住户，非常有必要从根本上解决问题，即将这些人口迁出核心区，住到白音锡勒镇上去，逐步提高他们的物质与文化水平，或至少从他们的第三代或第四代开始新的生活。这样，可以将救灾、扶贫、治理沙尘暴、医疗保健、教育等费用集中使用，从根本上提高了他们的生活质量，增强了他们作为保护区主人翁的意识。从保护区的角度出发，核心区这片宝贵土地，得以扩大并且保护下来。目前，生态移民的工作正在规划进行之中。

5.3.3　对生物圈保护区缓冲区社区的经济带动作用

在锡林郭勒盟的各种经济成分中，大农业无疑占据了重要的地位，值得注意的是以城镇（含城市）为主导的经济形式（交通、商业、建筑、服务）呈现上升趋势（图 5-2 A）；在大农业的各种成分中，以城镇化为主的家庭副业收入（副业、渔业）也呈现上升的趋势。这对于减少天然草地的环境压力是非常有利的（图 5-2 B）。

在城镇类型的社区发展模式中，她的经济发展应当定位在保护区的可持续发展中。生产活动强调高效益的集约化土地利用，强调专业分工，即高效饲草种植、收获、储藏、加工、饲养、挤奶、畜奶加工、运输、销售一条龙，杜绝恶性重复与自我竞争；在保护区管理与经营活动中，也要强调分工协作，培训专门人才，即导游、服务员、垃圾清理、保护区巡护、游人食品供应、传统文化展示、环境教育等工作逐步下放到保护区过渡区的社区居民，让他们结合自身利益主动参与，而不是受宣传教育影响或者干脆由人安排的被动参与，不是

由保护区的管理人员“越俎代庖”，由他们从事一些当地社区生存发展的活动。只要规划与管理得当，生物圈保护区所面临的发展与保护尖锐矛盾可以从根本上得到解决。而要实现这点，生态城镇建设与发展非常重要，可以说城镇是实现社区发展和退化草地得以生态恢复的重要枢纽。因此，各种重要的投资应当向这里倾斜。

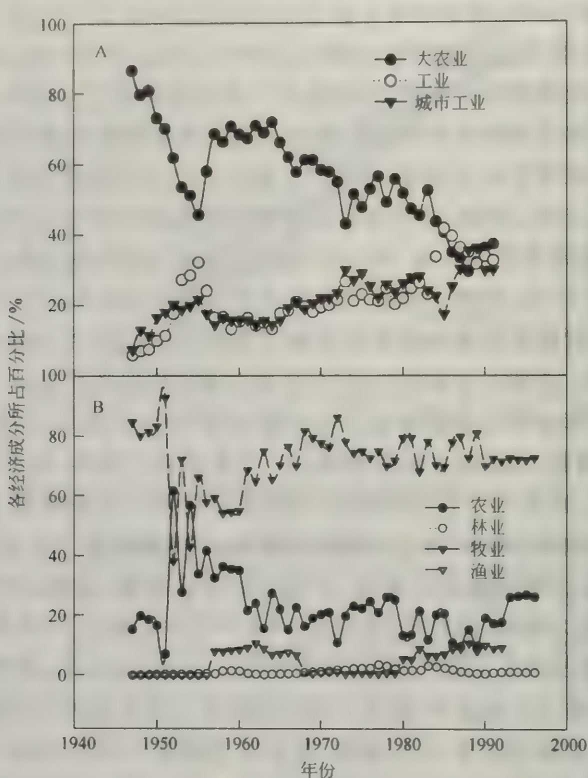

图 5-2　农业、工业和城镇工业在总经济成分中所占的比例(A)及大农业中各种经济形式所占的比例(B)

5.3.4　对保护区的社区生活与文化水平提高的综合作用

在城镇由于人口集中，可以开展的活动极易展开，从而逐步实现教育、扶贫、救灾、生产、生活与生态环境治理的多重目的，提高社区的生活质量。在白音锡勒镇，她的邮电、交通、旅馆、管理、机关、学校、医院、旅游服务设施等为在生物圈保护区中开展的生态旅游活动提供保障的同时，增加了本身的就业机会，锡林郭勒生物圈保护区必需的人才与信息的重要来源来自白音锡勒镇或更高层的锡林浩特市。人口的集中与土地集约化利用可以大大减少天然草地的压力，这可通过各种旅游业、加工业与交通运输业等专业化分工逐步实现，最终大大地提高单位面积土地上的经济效益。城市与城镇对于生物圈保护区的实际功能见表 5-2。

表 5-2　锡林浩特市与白音锡勒城镇发展对锡林郭勒生物圈保护区的功能途径

功能途径	直接作用	间接作用
人才培养、教育	科学管理(自然保护、动植物、畜牧业、水利、渔业);成人教育(技术、职业、继续教育);义务教育(小学、中学、技校);市场经济(规划、机制、品质、营销)、培训场所(游客中心、科技中心)	观念、意识转变、思想、行为、法制等观念的加强、外界知识的吸收、网络信息的获得、民族素质的提高
科技成果	适用技术推广、科学技术普及、科学技术实验、技术市场、生态环境质量的监测、科技实验设施的获得	科学技术思想的潜在功能发挥、科技市场的形成
新闻、宣传与娱乐	文化服务设施、民族文化的发挥、广播电视(牧户卫星电视系统、有线电视、电视信息服务)、牧区文化(传统文化、现代文化)建设	国内、国际重要新闻信息的获得主要通过锡林浩特城市与白音锡勒城镇、文化下乡活动
卫生与医疗保健	初级保健、流动医院、公共健身设施、镇卫生院、城市医院	重要疑难病症的解除、抗灾救灾消灾
民族体育	民族体育、体育馆、赛马场	民族体育走向社会
社会保障与社会服务	保险、治安、福利;社会化服务(农牧机具销售、维修)、劳务市场、科技咨询、信息服务、金融体制、邮政与通讯、牧区建筑施工、水、电、气、暖供应	牧区必须生活用品的获得、市场形式的交易

5.4　生物圈保护区对城市(镇)发展的作用

5.4.1　城市(镇)消费的食物来源

对于一个位于自然保护区中的城市来讲,锡林浩特城市和白音锡勒镇的食物消费主要来自当地的牧区和少量的农区,尤其是肉、奶类的消费如此。因为受强烈的蒙古传统文化影响,市区(镇)民的饮食习惯与牧民基本上是没有区别的。这样城市(镇)大量人口的食物消费就靠保护区的缓冲区社区供应。在保护区 10 786 km^2 范围内,牧民每年养羊 970×10^3 头,牛马等大牲畜 84×10^3 头,生产粮食 16×10^3 t;这其中满足保护区社区牧民自身的需求外,一大部分流入了城市(镇);另外,大量的流动人口(商贸活动、业务出差、游客等)的食物消费也在很大程度上依赖周围的草地生态系统。下面以锡林浩特市消费牛羊肉情况简要说明这方面的作用,锡林浩特城市在 1981 年—2000 年期间消费牛肉数量基本平稳约在 200 $t\cdot a^{-1}$ 上下,但对羊肉的消费呈现上升的趋势,这是由于人口增加和城市人口的饮食习惯决定的,目前仅锡林浩特市,每年消费羊肉 1 724 t,牛肉 236 t,这些食品主要来自自然保护区(图 5-3)。

城市对保护区食物的需求有正反两方面的效益。从积极的角度来看,它促进了周边保护区的社区经济发展,减少了保护区来自人为活动的土地压力(下面还要论述);不利

的一面是对生态环境的压力加大，尤其在草地连年退化的情况下，城市(镇)人群对肉奶等的消费依然不能停止，从而在一定程度上加速草地退化。

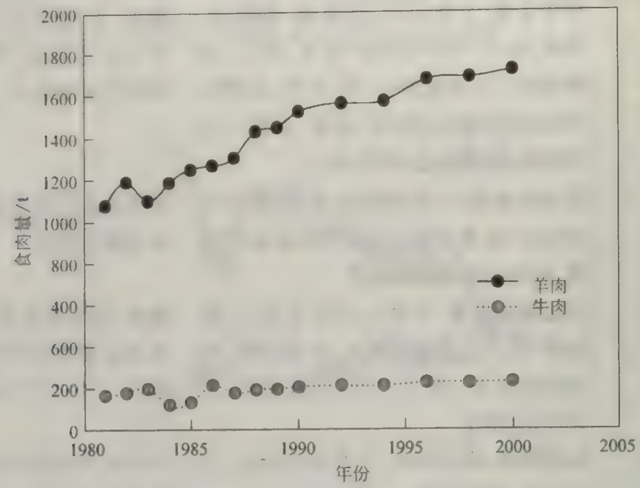

图 5-3 锡林浩特市每年消费牛羊肉的变化趋势

5.4.2 城市(镇)耗水

锡林浩特城市位于我国北方半干旱、干旱寒冷的大陆性季风性气候区，年平均降雨量只有 350 mm，而蒸发量确达 1 694 mm，为干旱缺水的城市，城市需水量大，且这种需求随着人口与城市的发展有明显的增加趋势（表 5-3），预计到 2020 年锡林特城市工农业与人口需水 74×10^6 m^3。除了固定人口与流动人口的日常耗水外，位于城市及其周围的几个工业用户如锡林浩特发电厂、胜利煤矿、氯碱厂、采油与炼油企业、煤化工等。除此之外，锡林浩特城市的郊区尚拥有部分的农业与牧业，农（草、蔬菜）业灌溉与牲口饮用耗水，都依赖于自然保护区的储水能力。地下水的过量超采已不能满足城市可持续发展的需求，因此位于保护区中的地面水源就是非常重要的饮用水的补充。锡林河在其中起着非常重要的作用，锡林郭勒生物圈保护区就是以保护锡林河水源地而划分的。锡林河集水面积达 3 852 km^2，多年平均径流量 1.8×10^6 $m^3\cdot a^{-1}$，是锡林浩特城市重要的饮用水源，是锡林浩特的“母亲河”。该河流的水量与质量的大小与好坏直接取决于自然保护区中天然植被的保护程度，应当引起高度的重视。

5.4.3 城市(镇)生态环境的保障

锡林浩特城市既然定位在“草原中的城市，城市中的草原”，主要是依靠其得天独厚的生态环境，即位于欧亚大陆上的典型草原。这样，锡林郭勒生物圈保护区的重要性就不言而喻。保护区中草地生态系统的退化直接影响了城市的生态环境质量，近几年来连续发生的沙尘暴、雪尘暴已经使锡林浩特人饱受了周围生态破坏带来的苦果。2000 年锡林郭

勒盟地区共发生沙尘暴 14 起,2001 年 16 起。其中 2001 年 1 月 1 日最严重的一起雪尘暴中,死亡人数 27 人,死亡牲畜 156 600 头,30 多万头牲畜丢失。草场退化还造成了城市旅游业的严重损失,锡林河水源也受到了严重的断流威胁。因此,锡林浩特城市的发展决不能只顾自己,而忽视了锡林郭勒生物圈保护区对城市生态环境的呵护作用。自然保护区对于城市(镇)生态环境建设的重要作用具体表现见表 5-4。

表 5-3　锡林浩特市主要耗水现状及其远景预测　($\times 10^3 m^3$)

项　目	1990	2000	2020
饮用水[1]	5 000	8 670	13 850
牲畜用水	3 600	3 620	4 330
工业用水[2]	10 600	15 520	36 880
农田灌溉	5 610	6 420	7 090
饲草料基地灌溉	1 500	8 250	12 000
总计	26 310	42 480	74 150

[1] 含暂住人口与流动人口饮用水;[2]工业耗水定额已考虑节水措施

5.4.4　间接的影响

除了上述直接的作用外,锡林郭勒生物圈保护区还在下述方面起着对城市(镇)发展重要的间接作用,城市(镇)发展如果充分考虑到这些间接的作用,则更能把握好各种机会,促进城市(镇)经济社会与生态环境建设事业的迅速发展,这些作用表现在:

表 5-4　锡林郭勒生物圈保护区对锡林浩特市与白音锡勒城镇发展的功能途径

功能途径	直接作用	间接作用
城市(镇)消费	食物(肉、奶、蔬菜、粮食)来源;清洁水源;清洁的空气;垃圾处理	环境效应带来的消费物品价格变化
城市(镇)经济	集约化草原畜牧业(肉羊开发、肉牛开发、优质山羊绒);生态农业经济(生态产品加工、庭院经济);加工业(肉、奶、革、毛、草原特色食品、生态旅游产品、水产品);矿产资源开发(煤、石油、有色金属、化工、建材)、气候资源开发(太阳能、风能)	国际生物圈保护区品牌效应;草原效应、天然生态效应、传统文化效应等
城市(镇)建设	城市绿化、美化、香化(草原植物、野生花卉引种);野生动物引入城市、特色建筑、草原文化与草原风情、生物多样性	利用生物圈保护区中城市的生态特色,吸引国家投资,建设与规划城市
生态旅游	游客的中转地、旅馆、餐饮、娱乐、购物环境;城市居民休闲、度假、生态旅游活动、那达慕大会	提高城市的知名度,与国内外的交流与合作、科技人员的介入、生物多样性与环境教育
生态屏障	沙地与沙源治理(浑善达克、嘎额勒苏沙地)、绿色防护工程、退化草地生态恢复、城市环境监测与治理的参照体	首都生态环境屏障、绿色奥运、环首都特殊生态功能区建设的潜在影响

(1) 锡林郭勒生物圈保护区是世界知名的品牌(联合国教科文组织建立的世界生物圈保护区网络成员)，她所保护的内容——欧亚大陆典型草原生态系统——在科学上具有重要的价值，是全人类共同的财富，受到来自世界各地的关注。

(2) 锡林浩特市以及白音锡勒镇知名度的提高得益于锡林郭勒生物圈保护区，来自国内外的大部分游客是冲生物圈保护区而来的，城市应因此要充分利用好这种无形资产，做好生态旅游的线路设计、游客服务的接待工作，逐步发展当地的旅游支柱产业。

(3) 锡林郭勒生物圈保护区既是世界级的保护区，又是国家级的保护区，还是全国第一个和唯一一个典型草原类型的最大的生物圈保护区，她受到国家有关法律的保护(草原法、土地法、森林法、野生动物法、自然保护区管理条例)。其中的土地、草原、水源、清洁的空气等是城市与城镇发展无污染的草原生态产品的有利的宣传武器，城市应当树立这块品牌。

(4) 锡林郭勒生物圈保护区是锡林浩特城市走向国际的一个窗口，每年因自然保护区开展的科学考察、学术研讨、业务培训、生态旅游、国际姊妹生物圈保护区交流等活动都会给城市与城镇带来走向国际的种种渠道。

(5) 是借助自然力实现退化草地生态系统恢复的最重要、最经济、最直接、最合理的场所；对与沙尘暴防止、沙源治理、环京津生态功能区建设与“绿色奥运”中的蓝天工程实施起着巨大的示范作用。在这里，锡林浩特城市面临着非常重要的机遇，她可以借助国家治理沙尘暴、沙源治理和环京津生态安全带建设的强有力资金支持力度，发挥该市的生态环境治理的核心城市作用，在这方面，北京以北的其他城市无法与之相比。但其中，草原退化生态系统治理必须打保护区的牌子才能吸引国家更重要的投入。

5.5　生物圈保护区与退化草地生态系统恢复

很多学者认为沙地草地退化的原因有自然（邱新法等 2001；全浩 1993；王式功等 1996)和人为（慈龙骏和刘玉平 2000；阎敏华 2001)两种，更多的学者将沙地草地退化以及沙尘暴等频繁发生归结为近年来的气候变化如干旱和高温（严中伟等 1990；陈龙勋等 1998；常兆丰等 1997；丁一汇和戴晓苏 1994；高素华等 1994；杨东贞等 198；叶笃正等 2000)。但我们认为人为原因是最主要的，而自然因素变化引起的退化影响很小（蒋高明 2001)。这是因为，在支持生态系统的六大环境因子中，光照并没有变化；温度正常波动；氧气含量也没有变化；二氧化碳增加部分(从工业革命前的 290 ppm 到目前的 350 ppm)，但这对植物的生长是有利的；水分虽有变化，总体雨量正常，部分年份还出现偏高。当然在降雨可能会存在季节上的分布差异，但这种差异在很大程度上是由于地表植被覆盖率的变化引起的。即便降雨会减少，我们都知道在温带以及寒温带地区雨、热、光是同期的，土壤水分在这一时期也最好（陈有君 2001)。既然适合植物生长的气象条件仍然存在，那么为什么草地的生长一年不如一年呢？原因存在于土壤和矿物质的巨大变化，草地生态系统的物质循环被人为中断了，土壤损失严重；在日益减少草地覆盖（地上部与根系保护)的条件下，疏松的土壤在冬春季被风吹走。皮之不存，毛将焉附？元素不能循环使生态系统的运转失去了一个“轮子”(另一功能是能量流动)。锡林郭勒生物圈保

护区中，白音锡勒牧场 1953—1980 期间因出售牲畜及其产品和燃烧粪造成氮素严重损失，损失的氮相当于 78 600 吨硫酸铵。欲维持该牧场的氮平衡需要每年输入 560 吨纯氮(陈佐忠和汪诗平 2000)，但遗憾的是这部分输入几乎为零，这对于土壤系统的破坏是致命的。

人口增加无疑是最主要的原因。由于人口增加(Mahtab & Karim 1992；Tilman et al. 1997；Ware 1997；Rishk 1986；Robert 1986)，尤其是大量人口增加后伴随的牲口增加(Skarpe 1991；McNaughton 1990)、人口贫困与土地退化(Dasgupta 1992；Charistainsson 1998)等问题在世界其他各地都有过报道，但像内蒙古草原生态系统的大规模退化和由此带来的严重的生态环境灾难确为数不多。锡林郭勒盟从建国初的 20.5 万人增加到目前的 92 万人，净增加 348%。随着人口的增加和人类对生活物质的追求，牲畜数量更是急剧增加，从 160 万头增加到 2 300 万头，净增加 1 700%，这样使草地的压力急剧加大，超过了其极限。支持一个标准羊单位的草地面积直线下降，从原来每 77 亩草地支持 1 只羊到 7 亩地 1 只羊，草场压力净增加 950%。社区生活方式的变化以及由于这种变化而实行的政策导向也是重要的原因（如牧民不吃亏心粮）。由游牧而定居，且追求现代化的生活目标，更加重了草地的退化。保护区内在最近 10 年地表活化，退化草地面积的扩大与该期间牲畜数量的加倍很好地吻合（在一个很大的基数上的加倍，如由 1 000 万头到 2300 万头)，图 5-4 正说明了这一点（图 5-4)。

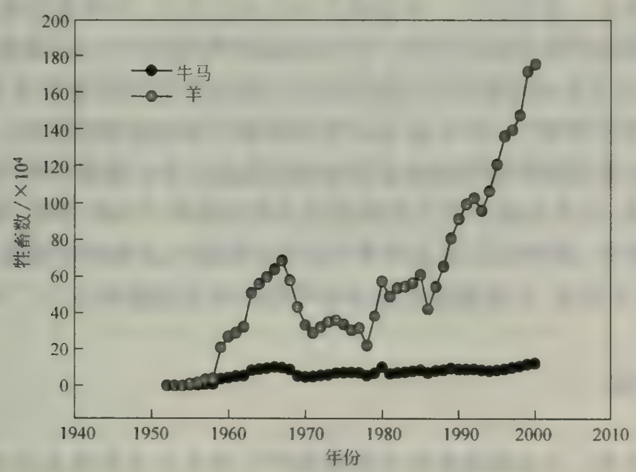

图 5-4　锡林郭勒生物圈保护区牲畜数量动态(1950—2000)

实际上，在元代（公元 1206 ）以前锡林郭勒草原基本上是没有太大的人为压力的，人口的数量很少，主要依靠天然放牧；元忽必烈时代(1260—1264)“户口增，田野辟”，“召集逃亡，鼓励垦荒”，“军民屯田”等措施开始对这片土地利用；明嘉靖三十三年(1554)“招纳汉民，开荒耕种，建室定居”，定居开始出现；清朝初年(1616—1644)“借地养民”，建“大粮地”，“公主府地”，“军事驻防地”，招徕大批汉民佣种，并开放牧场，使草地压力有所增加；但清中期(1662—1862) 的“休养生息”政策，使这里的土地基本稳定了 200 年；清中后期(1862—1909) 实施“移民实边”，农牧交错区开始出现；清光绪 27 年 (1902)“开放蒙

荒”以及紧接着中华民国初年(1912)的垦务总局成立,使这里草地退化开始起步(内蒙古大词典编辑委员会,1991);但是,我们认为最大的几次生态破坏是出现在20世纪的50年代和20世纪70年代:“大跃进”运动(1958—1960),第一次草地垦殖高潮;文化大革命期间(1969—1978),第二次草地垦殖高潮,这期间采取了“以粮为纲”,“牧民不吃亏心粮”等政策,鼓励了对天然草地的掠取;尽管如此,致命的破坏当属最近10年,头数畜牧业使草场到了崩溃的边缘。

对上述退化草地生态系统的恢复,其核心之处就应当让草地能够“休养生息”,使生态系统的功能正常实现,达到可持续利用的目的。要实现这一点,首先要使牲口的数量减下来,要大大地减少;而要减少牲口数量,最直接的办法是把在草地分散分布的人的数量减下来,人减少了,他们放养的牲口对草地的破坏随之而消失了。另外,将退化严重的草地必须实现围封,依靠自然的力量实行“无为而治”的自然恢复(Bradshaw 2000);至少在植物生长敏感的春季要实行禁牧。但是,围封或禁牧后,牲口吃什么,这就依赖于高效地的建设。而人口迁移与集中以及高效地建设,都必须在规划完好的城镇进行,要有必要的电力、水源、交通与防护措施保证(千方百计保护好土壤不使风吹走!)。因为已经不可能使牧民重新回到原始的游牧状态,而发展现代化的有蒙古特色的生态小城镇,提高他们的生活与文化质量则是普遍受欢迎的。对于退下来的退化草地恢复,依靠自然恢复就完全可以实现了。我们在浑善达克沙地进行的实验证明,围封1年后的退化草地基本实现了生态意义上的恢复。围栏实际上就是缩小的自然保护区,所依靠的就是自然界本身的力量。建设生态城镇在减少人口与牲口压力方面的作用是巨大的,要是整个锡林郭勒盟实现70%的城镇化(国外发达水平),且这些人口都是来自从退化草地上迁移来的牧户,那么苏尼特左旗等于增加了6 632.36 km^2天然草场!虽则这样把部分人口的压力带到了城镇,但是,这种依靠自然力途径的生态治理模式比起目前普遍采用的“种树种草”模式来讲无疑要经济得多、有效快速得多。所腾出的大部分费用(飞播、树苗、种子、救灾、救济、灭蝗、灭鼠、生态补偿、各种社会募捐等等)则可以全部用来发展城镇的生态生产耦合模式,提高社区的生活质量,从而促进社会生态与经济的良性循环。

5.6 几点建议

从前面的分析看,人是锡林郭勒生物圈保护区草原生态系统退化的主要原因,目前保护区存在核心区太小,社区发展与保护区的建设严重脱节等问题。退化的最主要驱动因素、欲治理沙地退化和沙尘暴,必须从解决人的因素入手,解决人的生存与出路才是治本,其余措施是治末。而在解决人的出路方面建设生态城市与城镇是最为有效的。为此我们建议:

(1)锡林郭勒生物圈保护区退化草地的恢复应以发挥自然的力量为主,即对严重退化的草地进行围封,适当采取必要的辅助措施,但务必注意尽量不能破坏原有的生态景观与生态平衡,尤其对外来入侵种的引入务必慎重。应当旗帜鲜明地反对在天然草地上种植以杨树为单一物种的纯林,这种生态系统是危险的,是一种对天然草地的人为侵掠,这对草场恢复并无益且十分有害(如破坏整个系统的水循环等)。

(2) 生态城镇建设与社区发展。在这一点上，很多问题如就业、救灾、教育、交通、通讯、能源、生活质量、生存环境改善等等与社区的进一步发展密切相关，更关切到治理的成与败。让牧民重新回到游牧可能存在操作上的实际困难，调查发现很少有人愿意这样做。必要的措施包括“生态移民”和规划建设“生态小城镇”。逐步实现由分散的随机住户型发展为高质量、高起点、最低环境破坏的有蒙古特色的现代化生态小城镇。

(3) 在土地使用布局上，采取“以地养地”策略，即在有水分、电力、肥料等保证的地方建立高效地(以丘间低地和低湿地为主)，并进行生产与生活，腾出大量的退化土地进行封育并进一步发展成保护区。两者的比例可为 1∶30，甚至为 1∶100。这是由于目前在退化草地上的产草量只有 20 斤/亩～30 斤/亩，而通过一定技术措施后的饲料产量可达 1 500 斤/亩以上。目前由中国科学院植物研究所进行的有关的研究正在进行中，实验 1 年后的效果异常明显。问题的核心是如何防止土壤的流失和新辟土地的退化，使之可持续利用。这样做的理由是，建立在高投入、生态系统结构与功能正常的集约化农业(牧业)不会退化，内地 5000 年的农业文明一直没有衰退，主要原因是那里的土地没有退化。相似的，在以传统农业为主的年代，水土流失和土地退化很少发生。

(4) 在土地使用功能上，实现生态系统的物质“生产”与人类“生活”的耦合，并逐步实现生态系统的食物链与社区生存发展的产业链的耦合；待草地类型自然生态系统恢复后，发展替代产业(生态旅游、旅游产品、高附加值的狩猎、教育与实习基地等)，逐步减缓对大面积草原的土地压力。

(5) 在经费的使用上，中央财政的生态治理费（治沙经费）、用于救灾的经费、生态补偿的经费、各种社会捐助、地方政府经费应向该沙地的社区倾斜，发展小城镇，解决水、电、通讯、交通、教育、生活质量提高等方面的具体问题，减少他们的对环境的破坏，停止目前普遍采取的“种树种草”做法。因为利益的关系和土地使用功能的转变，观念的转变，锡林郭勒生物圈保护区的居民会由被动参与生态治理转变到主动的参与，从而使他们由生态的破坏者转变成生态的保护者。这是关系到治理能否成功的关键。各级领导应当积极推动这种“以人为本”、以城镇建设带动为基础的生态治理模式。

第 6 章

锡林郭勒生物圈保护区管理体系的反思和探讨

6.1 共同的教训

锡林郭勒生物圈保护区面积 10 786km^2，占全盟土地面积的 5%，在我国现有的 21 个世界生物圈保护区中面积最大，属于大型自然保护区。区内人口 17.3 万，包括诸多部门、企业以及锡林浩特市。这成为该保护区管理所面临的极大挑战。最初规划和建立保护区时，出于流域保护的整体考虑，将整个锡林河下游流域都划入保护区范围内，并且把草原利用与保护结合，把探寻可持续发展的途径作为保护区的重要目标（见专栏 6-1）。现在回过头来看，规划中的分析推断十分精辟透彻，切中要害而又具有前瞻性，符合生物圈保护区概念和当今自然保护与地区发展相结合的新的主张和趋势，为该保护区在地区社会、经济、生态协调发展的过程中发挥积极作用确定了方向。

专栏 6-1　锡林郭勒草原自然保护区的规划目标

我国草原生态系统已遭到不同程度的破坏，草地资源的数量、质量下降，环境质量变劣，种质资源正在丧失。这些变化已影响到草原区的经济发展和人民生活的提高。如任其发展下去，将导致严重的后果。为了扭转这种趋势，必须采取有效对策，把草原利用与保护结合起来，求得草地资源的永续利用和草原区经济的持续增长。建立草原自然保护区，就是为保护和合理利用草原而采取的重要措施之一。

（锡林郭勒草原自然保护区规划 1985）

经过千百年来的人类经营活动，草原生态系统曾经受了多种不同方式、不同强度的扰动，真正的、纯自然的草原生态系统现在已不复存在了。当今我们面前的草原是一份自然历史遗产，她还在承受着比历史上任何一个时期都更为强烈的冲击，使她不得不承受着越来越深重的超越生态安全阀值的承载压力，家畜头数、害虫虫口、鼠害数量和人口的数量几乎同步呈膨胀性的直线增长的态势，而草原上的优良牧草、益鸟益兽的种群数量和群落的生产力则呈负增长，不少生物物种早已灭

续专栏 6-1

绝，草原生物多样性的选择价值，遭到了严重的损失。草原生态系统的结构和功能在各级时空水平上，种群水平——群落水平——景观水平上，都表现出明显的脆弱性和不稳定性。…… 更为严重的是，大面积的草原景观的碎裂化现象、草原城市的大气、水质和工业开发区净土的被污染现象、滥牧、滥采所形成的退化现象等，至今并未引起人们真正的重视，而被看做是司空见惯，习以为常的一般自然社会现象，或认为草原功能的退化，在社会发展的强劲冲击波影响下，有一定的必然性和不可避免性。

面对以上现实，作为自然保护工作者，深感我们有责任在传统民族文化与现代先进科学的结合上，在可持续发展的新思维观念的指导下，探索和寻求出一条可以解决这一重大环境－生存－发展问题的可行而又有效的途径……

（锡林郭勒草原自然保护区规划 1996—2000）

然而，今天出现的却是与以上构想和设计相反的局面。大面积草地生态系统退化加之自然灾害袭击所带来的地区性的生态恶果，使保护区内的状况也未能呈现例外。试图用围栏加以严格保护的几个核心区仅占保护区总面积的 0.17%，成为镶嵌在大面积的退化草地中的几个点状的孤岛，而且也没能逃脱屡遭破坏的命运。内蒙古大学仝川的研究表明，保护区内由于过度放牧造成的退化草场面积占可利用草场面积的比例在 1999 年已达到 82%，比 1985 年锡林郭勒保护区成立时增加了 5.5%，其中中度和重度退化草场增加了 13%。

保护区自建立以来，其管理机构经过 3 次较大的调整，历届管理班子都在多种因素的局限内做了大量努力，推进着管理工作的改善。在困难的条件下保护区管理人员坚持开展着核心区的看护、草地植被的长期监测、公众教育等项工作，尤其是与澳大利亚 Bookmark 生物圈保护区结为姊妹友好保护区，并以此创造性地推动了当地多方位的对外开放与交流（见专栏 6-2、专栏 6-3）。然而这些工作的效果都必须接受区内生态系统和生物多样性的总体现状的检验。于是出现了所做的工作与最终的目标相去甚远的事实：16 年来的努力未能阻止在她建立之前就已经存在而又不断加剧着的退化过程，更未能实现最初的从整体上保护锡林河下游流域生态环境的构想。这一严酷的现实把锡林郭勒生物圈保护区推到一个十字路口，使人们不得不从政策的角度重新审视围绕保护区所发生的一切，并面临着一次方向性的抉择。

专栏 6-2　锡林郭勒生物圈保护区的科研监测与公众教育

科研监测　保护区成立初期，通过与内蒙古大学和中科院草原生态定位研究站的合作，完成了大量本底资源调查和监测工作，编辑出版了“内蒙古锡林郭勒自然保护区基础研究资料汇编”。自 1994 年以来，保护区管理人员独立承担着区内的生态监测工作，主要是对几个核心区、缓冲区、石油开发区的植被样地调查和地表水、大气的监测，共测得数据 23 870 个，采集制作标本 500 余个，并完成了 1994 至 2001 年的"锡林郭勒草原生态监测年鉴"的编制。另外，1998 年以来保护区管理局分别同日本土壤动物专家寺家田美子合作进行了土壤动物和植被监测；与内蒙古自治区环境保护监测中心联合进行了遥感卫星影片实地解译；与澳大利亚 Bookmark 生物圈保护区鸟类专家肖尼亚合作进行了鸟类观测。

续专栏 6-2

公众教育 保护区建立以来每年都接待专门来草原实习的大专院校师生、中小学生和从事草原研究的人员上百人，包括日本、南韩、蒙古、澳大利亚等国的学生和学者。1995 年保护区建立了一处 300 m^2 的展厅，展示保护区内的动植物标本、图片和有关知识，成为访问保护区的游客必到之处，7 年来共接待了 10 万余游客。为加强保护工作，保护区还印制了大量蒙汉文字的“公告”、“管理条例”和彩色宣传单，对社区居民和游客发放，还与电视台合作制作了保护区专题片一部。基于多年来保护区在教育方面发挥的作用，她被盟公署指定为“爱国主义教育基地”。

锡林郭勒生物圈保护区　岱青　提供

专栏 6-3　锡林郭勒生物圈保护区与澳大利亚 Bookmark 生物圈保护区

1995 年锡林郭勒生物圈保护区与澳大利亚 Bookmark 生物圈保护区正式结为姊妹生物圈保护区，6 年来双方开展了一系列交流互访和培训活动。不但促进了保护区管理人员能力和素质的提高，还扩展到锡林浩特市的许多部门和产业与澳大利亚对应的交流和互访。由双方保护区牵头组织互访共计 13 团次。中方代表团访澳 8 次(其中中方访澳 6 次，接受培训 2 次)，包括锡盟盟委、盟公署、盟城建环保局、白音锡勒牧场、中科院草原定位研究站、自治区环保局、华油油田、电业局、市政府、市公安局、自来水公司、西乌旗土地管理局等单位都参与过互访交流。澳方来访 5 次，包括 Bookmark 保护区管理人员、当地市政领导、专家、牧场主、企业主和志愿人员的来访。通过两个保护区的友好关系带动两个地区的交流和往来，超出了预想的意义，同时提高了保护区在当地的影响和知名度，促进了保护区与许多部门的合作关系，为建立国际友好生物圈保护区提供了范例。如何进一步发展这一友好关系，开展两个地区的保护与可持续发展的合作，是锡林郭勒和 Bookmark 两个保护区正在探索的课题。

锡林郭勒生物圈保护区　苗河　提供

生态的恶化给我们提出了一连串的问题：为什么以流域保护为出发点，而最终却走到孤岛的境地？深层的原因在哪里？面对周边的大面积草地退化的现状，被保护的几个点状孤岛究竟有多大意义？保护区采取什么样的管理对策才能避免这样的结果，真正在保障地区的生态安全和促进可持续发展方面发挥作用？

上述问题是对生物圈保护区管理局及其政府主管部门提出的一个重要课题，同时也是保护区内和周边与之相关的企业和人们，以及一切由于这一地区生态恶化而遭受不同程度损害的人们应当认真思考的问题。如果说保护整个流域生态环境和实现地区的可持续发展在建立保护区之初还是一种构想的话，那么今天它已经通过极为严重的教训而成为紧迫的现实需要了。因此在我们把过去作为教训总结的时候，这一教训绝不仅仅是对于保护区管理者而言的，而应当被视为这一地区以及与这一地区有关的所有部门和人们的共同教训。

锡林郭勒盟公署对该地区的生态保护和保护区的问题给予了前所未有的高度重视，于 2000 年做出了一系列关键性的决策，包括建立锡林郭勒国家级草地自然保护区管理委

员会和搬迁牧户扩大保护区核心区。然而有效地贯彻盟公署的决定，也需要我们对共同的教训进行深入的思考和总结。

6.2　生物圈保护区为什么陷入孤岛的境地

6.2.1　透支使用自然资源

锡林郭勒生物圈保护区区域范围归锡林浩特市管辖，包括 4 个牧场：白音锡勒牧场、毛登牧场、贝力克牧场、白音库伦牧场（北半部）；4 个苏木（乡）：伊利勒特苏木、白彦乌拉苏木、朝克乌拉苏木、阿拉善苏木；2 个市镇：锡林浩特市和白音锡勒镇。除了位于市镇内的企业而外，还有煤矿、石油、沙石场、砖瓦厂、水泥厂、旅游度假村等十几个企业分布在锡林郭勒生物圈保护区范围内。区内土地的 80％以上用于放牧畜牧业，形成了以放牧畜牧业为主的产业结构。这些市镇和产业在锡林郭勒生物圈保护区建立以来的 16 年间都取得了长足发展，区内人口从 10 余万（1985）增加到 17.3 万（2000）；国内生产总值由 10 283 万元（1985）增加到 251 697 万元（2000），增加了 23.5 倍；牲畜由 708 675 头（只）（1985）增加到 1 921 425 头（只）（1999），翻了近三番；畜牧业生产总值由 1 894.5 万元（1985）增加到 14 035.8 万元（1998），增加了 6 倍多（锡林浩特市统计局 2001）。实际上 16 年前锡林郭勒生物圈保护区范围内已经出现了大面积草地退化，那时的退化草地面积已经达到 76.23％。上述长足发展实际上是从一个已经退化的生态系统中获取的，是用生态代价换来的。

生物圈保护区内生态系统退化不断加剧的事实无可争辩地说明我们在认识和利用自然价值时出现了严重偏差。这里不妨借助对自然的全部经济价值的分析，来看一看我们的失误出在哪里。从人类利用角度出发，自然的全部经济价值（见图 6-1）包括可利用价值和非利用价值。其中可利用价值包括直接、间接和选择价值；非利用价值包括遗留价值和存在价值（IUCN 1998）。这也是通常使用的对自然保护区价值的表述，具体可参见自然生态系统各种价值（见表 6-1）。维护自然的多种价值，是保持生态系统的完整性，使其为社会经济的可持续发展提供支撑和服务的需要。

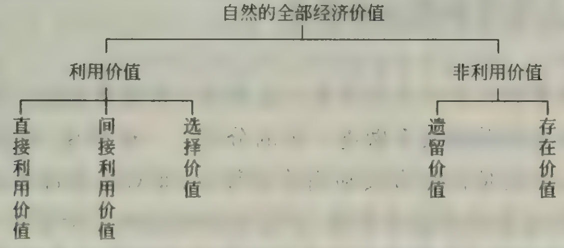

图 6-1　自然全部经济价值分析

表 6-1 自然生态系统中各种利用价值和非利用价值

利用价值			非利用价值	
直接利用价值	间接利用价值	选择价值	遗留价值	存在价值
休闲旅游	生态服务	用于将来的信息	遗留给后代的可用和不可用价值	生物多样性
持续收获	稳定气候	将来的利用(可用和不可用价值)		仪典/精神价值
野生生物收获	洪水控制			文化遗产
薪柴	地下水补充			社群价值
放牧	碳的贮存			景观
农耕	栖息环境			
基因获取	营养物质保持			
教育	抵御自然灾害			
研究	流域保护			
	自然服务			

(IUCN, 1998)

锡林郭勒生物圈保护区内生态系统退化清楚地反映了这样一个过程:自然的直接利用价值被超越限度地使用,对自然的间接利用价值、选择价值和非利用价值的维护被忽略;而在直接利用价值中又过于集中于畜牧业生产,忽视其多种经济价值的发挥;在畜牧业生产中又过于依赖靠天的放牧畜牧业,忽视对畜牧业的投入;在利用程度上超过草地生态系统的承受能力,结果损坏了生态系统的服务功能,使得生态系统在人为压力和自然灾害面前失去了自我调节能力。这种割裂的透支式的利用自然价值的方式蓄之已久,加上近几年连续的自然灾害,导致整个自然系统的衰退,包括大面积草场退化即草地直接利用价值的丧失。伴随生态恶化出现的是经济衰退,养羊赔钱成为近年来的普遍现象。根据本项研究的调查和估算,环境退化带来的经济损失在一个中等富裕程度牧户的总支出中已达到的 53%,在整个保护区内畜牧业总支出中占 38%。保护区内各层领导和牧民已经忧感到如此下去再有三五年,可以放牧的草场连同放牧业一起将不复存在。

6.2.2 公共利益未能得到有效的保护

人们在利用自然资源时为什么会出现上述偏差? 很值得总结。我们可以对人与自然的全部经济价值与人类利益的关系做进一步的分析。一般来说,在自然的全部经济价值中资源利用者所关心的仅是自然直接利用价值部分,而对其他部分价值不感兴趣(Warboys 2001),尽管他们也在享用这些价值,如自然的间接利用价值中的生态服务、营养物质保持、抵御自然灾害等价值。他们往往忽视这些价值的重要性的原因是这些价值是社会共享的公共价值,而且不能直接通过市场变成个人手中的货币。他们更加难以认识到与后代利益有关的自然的其他价值。为了便于后面的讨论,我们不妨把自然的全部价值

按照其所对应的人类利益分为个别利益与公共利益两大类，前一类(包括部门、局部或个人利益)与自然的直接利用价值相对应；后一类则与间接利用价值和非利用价值对应。这样便于我们分析自然价值与受益者之间的关系。

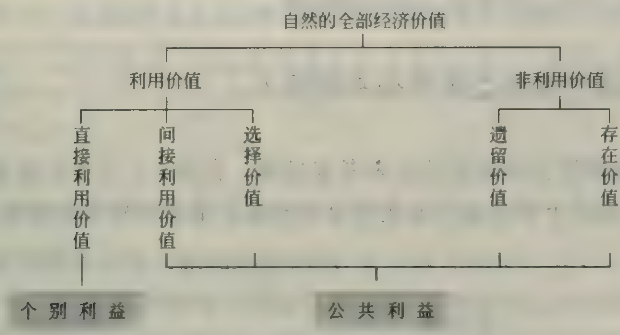

图 6-2　自然价值和受益者的关系

在草原资源开发利用过程中政府政策并非未考虑到公共利益，12 年前，为了促进牧业生产同时加强草场资源的保护，锡林郭勒地区实行了牲畜与草场双承包的生产责任制(见专栏 6-4)。尽管草场承包制对以草定畜和保护草场资源做了明确具体的规定，但是十几年过后还是没有摆脱头数畜牧业的怪圈，牲畜头数仍在成倍增长，草地退化的程度在加重和扩展，公共利益严重受损。这是十分典型的例子，说明公共利益往往被眼前的个别利益所冲击而停留在纸上，它需要有强有力的代表加以切实的管理才能得到保护。

专栏 6-4　关于畜草双承包政策

1989 年开始实行草场有偿使用，明确了责、权、利，按牲畜头数收取草原管理费，按草产量定载畜量，超载过牧要指令性提高出栏和加倍收取管理费。此后结合贯彻落实草原管理实施条例，锡盟畜牧业开始普遍实行畜草双承包责任制。规定 3 年～5 年内，每一个承包户至少建 200 亩草库伦，草库伦内要采取施肥、补播、种植、灌溉等措施，建成草库伦后，第 3 年开始每亩要产干草 200 斤，达不到者每亩罚款 1 元。种草种树谁种归谁所有长期不变，允许继承和自行出售其产品。对承包草场发放草场使用证。……

草场有偿承包依据“草原法”和“草原管理条例”，并对草场进行斟测，划分界限，分出类型，确定等级，测定产草量，规定载畜量，定收费标准后，与承包户签订承包合同，做法律公证，实行草原生态平衡。承包草场超载 5% 以内不收草场补偿费，并允许调剂划场、借草场，超载 6%～11 % 以上加收草场补偿费，每只羊 30 元，超载而不完成出栏任务和牲畜改良任务的，加收补偿每只羊 5 元。明确了承包户的责、权、利关系。

(锡林郭勒盟志编纂委员会 1996)

锡林郭勒地区经历了 1999 年以来连续 3 年的自然灾害，人们在饱尝生态破坏的恶果之后，才深有感触地认识到生态安全的重要性，认识到原来一个地区社会经济的发展是建立在生态环境基础上的，而健康的生态环境需要通过有效的措施加以保护。于是，关于公

共利益的自然价值部分由谁来维护？怎样维护才能真正有效？成了随之而来的问题。实际上16年前建立的以流域保护为目标的锡林郭勒生物圈保护区就是要担负这一职责的。然而，为什么在有公共利益专门代表的区域范围内也出现了公共利益未能得到有效保护的结果呢？这正是本项研究要深入探讨的问题。

6.2.3 公共利益代表缺乏来自公共的投入

维护公共利益需要公共利益的代表者或机构。在图6-3中我们称公共利益代表者为资源保护管理者，称从个别利益出发使用自然直接价值者为资源利用者。

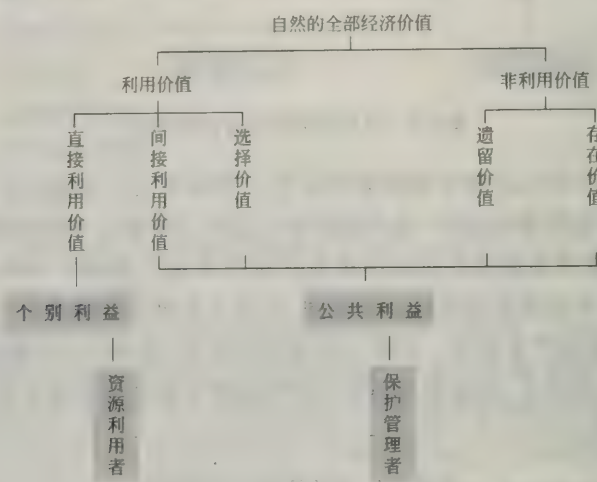

图6-3 保护管理者是公共利益的代表

资源保护管理者应当站在公共利益立场之上维护自然的全部经济价值。这样的保护管理者可以是由当地资源利用者推选出来的委员会，在国外比如加拿大就有这样的例子。而在多数情况下，由于资源利用者的兴趣只集中于自然的某一种直接利用价值，忽视或没有能力自发地维护公共利益。在这种情况下需要政府委派1个专门机构担负公共利益代表的职责。尤其是某一区域的保护价值具有地区和国家意义时，基本上是由政府建立自然保护区。我国绝大多数自然保护区是这样情况下建立的。然而这样建立起来的自然保护区能否真正站在公共利益之上执行职责，又取决于许多条件，包括能否得到足够的资金用于维护公共利益所必做的工作，以及机构的建制是否确保能够有效地开展工作。在这2个方面，锡林郭勒生物圈保护区都遇到了问题。这里我们先讨论资金问题，机构建制问题在后面讨论。

锡林郭勒保护区于1985年建立时定为省级自然保护区，1997年晋升为国家级自然保护区。它在16年里得到的来自各级政府的投入总和为266万元(见表6-2)，平均每年16.6万元，仅是2000年保护区范围内牧业净收入4 652.70万元的0.35%，是锡林浩特市辖区1988至2000年平均年财政收入4 069.76万元的0.41%。16年来保护区自我创收用于保护的费用为113.86万元，加上从政府得到的266万元，两者之和为339.86万

元，平均每年得到经费 21.24 万元，即每年每平方公里 19.7 元，相当于 2.46 美元，仅是全国自然保护区每年平均投入水平的 1/20，国家级自然保护区每年平均投入水平的 1/40（韩念勇 2000）。

表 6-2 锡林郭勒生物圈保护区建立 16 年以来得到经费投入情况 单位：万元

	房屋建设	人员工资	核心区维护	科研监测	其他运转费	非管理用款	合 计
政府投入	110	15	40	10	31	20	226.00
创收投入		62.6	51.26		9		113.86
总 计	110	77.6	91.26	10	40	20	339.86

由于从政府得到的资金投入极为有限，保护区自建立以来不得不一手抓创收，一手抓管理，而在总体投入水平极低的情况下实际上将创收自养摆在工作的首位。虽然这一状况在 1999 年以后随着领导班子的更换有所好转，但是仍未从根本上得到扭转。这一处境使该保护区机构一直未能摆脱既是管理者又是资源的利用者、经营者，既是公共利益代表又是区内的一个利益集团的双重角色。至今保护区下设的派出所没有办公地点，人员工资和运转经费全靠自我创收来支付（见专栏 6-5）。锡林郭勒保护区已经建立 16 年，连自身的生存问题也未得到解决，这样的尴尬处境，使她名为公共利益代表，实际上难以克守职责。

专栏 6-5 锡林郭勒生物圈保护区治安派出所的建制和面临的问题

锡林郭勒保护区治安派出所是于 1998 年经锡林郭勒盟行政公署、内蒙古自治区公安厅等批准建立的。职责是维护保护区内的社会治安和保护自然资源，依法查处破坏保护区设施和自然环境及自然资源的违法案件。派出所是由保护区管理队伍选拔出并经过人民警察培训的 4 名人员组成。派出所成立 3 年以来加强了自然保护法规的宣传，向社区发放宣传品 8 000 多份。同时加强了法治管理，依法查处捕猎、挖药、滥伐以及污染和破坏环境案件 28 起，涉案人员 121 人，处理治安案件 2 起，成为保护区管理机构的一支重要力量。

但是，目前派出所的人员未列入保护区管理机构编制，人员工资和运行经费全部由保护区下属的旅游经营实体和门票收入来支付。工资长期拖欠，派出所至今没有固定办公地点，设备极为简陋，连最起码的望远镜和取证用的照相机也没有，严重影响着工作的正常开展。

锡林郭勒生物圈保护区 阎云 供稿

6.2.4 缺乏维护公共利益的游戏规则

建立自然保护区的目的是维护公共利益，而维护公共利益需要公认的游戏规则，即法规政策。每个保护区所处的社会、经济、生态、文化背景不同，对公共利益的损害和威胁来自不同的原因，随着社会经济的发展变化这些原因也在发生变化。因此，针对具体情况的法规政策和规章制度是公共利益管理者日常工作不可缺少的依据。自然保护区条例中已经有明确的规定，“自然保护区管理机构的主要职责是：① 贯彻执行国家有关自然保护的

法律、法规和方针、政策；② 制定自然保护区的各项管理制度，统一管理自然保护区……”

锡林郭勒生物圈保护区内包括诸多的资源利用者，如牧场、煤矿、油田、水泥厂、砖瓦厂等等。新的产业在生长和发展，如旅游。维护区内的公共利益要与这么多资源利用者打交道，需要针对不同对象的具体游戏规则。但是目前可依据的法规基本上是国家层次的，如“中华人民共和国草原法(1985)”、“中华人民共和国环境保护法(1989)”、“中华人民共和国森林法(1984)”、“中华人民共和国野生动物保护法(1988)”、“中华人民共和国土地管理法(1986)”、“中华人民共和国矿产资源法(1986)”等，这些法规对于解决当地的实际问题显得过于笼统，缺乏细则。

另外，目前所执行的法规主要针对一些非法行为，如非法捕猎、采摘等，而面对由于经济发展带来的生态环境的破坏，却没有相应的法律依据去管理和控制。如草场退化是区内最主要的生态问题，它涉及诸多方面的原因，针对每一因素都需要建立相应具体的约束管理办法和规章，然而这方面政策法规的建设几乎处于零的状态(见图 6-4)。盟公署颁发的草场承包制对承包人所规定的草场建设和保护责任在保护区内也未能执行，而且对未能执行的原因也从未做过分析。正因为缺乏具体的法规约束和执行法规的力度，虽然牲畜数量的控制早已被认识到，但是区内牲畜数量的发展还是处于无控制的状态。

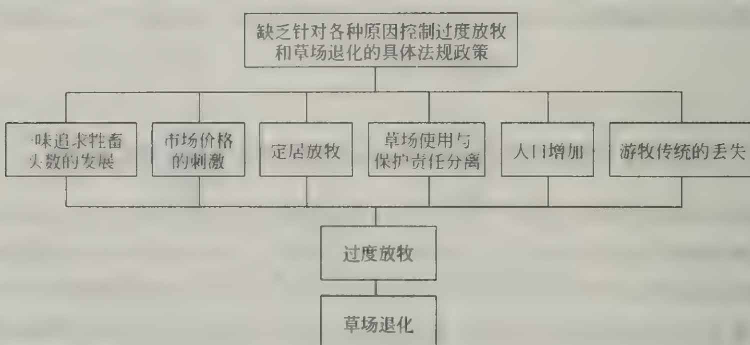

图 6-4 缺乏控制过度放牧和草场退化的具体政策法规

随着市场经济的发展许多以前未曾有过的经济活动不断出现，例如旅游业的兴起使保护区范围内在近几年里出现了数十处规模不等的度假村，保护区管理局对此却没有审批权和相应的管理办法；一些企业已经在利用锡林郭勒保护区的牌子做产品推销，但是并未取得保护区管理局的同意，也未通过任何质量检查。面对新的问题保护区管理的依据仍然停留在国家层次的法规，在处理所面对的许多具体而又十分复杂的问题时找不到依据，包括 2001 年才颁布的“锡林郭勒国家级草原自然保护区管理条例”也需要进一步细化。规章制度定下来后还需要监督执行。随着生态、社会、经济发展变化，政策法规需要不断调整，这方面存在着大量的空白。

6.2.5 土地权属的困扰

保护区内的土地权属问题是长期困扰保护区管理局的另一个关键问题。在所划定的

保护区范围内的土地使用权分别归属于 4 个国营牧场、4 个苏木(乡)和 1 个市,而保护区管理局没有任何土地权。这给锡林郭勒生物圈保护区的管理带来极大的不便。于是争取得到土地权属成了历届保护区管理班子努力的目标,也成了令保护区管理局耿耿于怀的老大难问题。经过十多年的努力,截至目前锡林郭勒生物圈保护区才拿到 8 个功能区中 1 个土地的使用证(见表 6-3)和 6 个功能区土地使用权的批准,但尚未得到土地证。争取拿到另外 1 个功能区土地使用权从而取得全部 8 个区的土地使用权成为保护区管理局的努力目标。但是即使拿到全部 8 个区的土地使用权,其面积比例不足 0.17%,微不足道。保护区管理局虽然早已认识到这部分区域的面积和代表性都十分有限,却不敢奢望将其管理扩大到其土地权属以外的区域,而是将管理工作仅仅局限于面积不足 0.17%的范围,从而背离了流域保护的初衷,走上了孤岛化的过程。根据盟政府的最新决定([2001] 52 号文件),责成有关部门"制定保护核心区生态移民计划,争取用 1 年～2 年的时间完成核心区周边牧户移民搬迁任务"。然而在搬迁过程中土地权属仍然是有待妥善解决的敏感问题。

表 6-3　锡林郭勒生物圈保护区核心区、试验区等土地权属状况

功能区	建立时间	面积/km^2	土地权属状况
查干敖包草原核心区	1985	5.5	已有使用权,但没有土地证
巴彦乌拉灰腾希勒草甸核心区	待建	5.5	没有土地使用权
海流特典型草原核心区	1985	5.5	已有土地使用权和土地证
陶乌音陶勒盖残遗云杉林核心区	1985	1	已有使用权,但没有土地证
阿布都尔图山杨、白桦林核心区	1985	1	已有使用权,但没有土地证
东台子退化草场改良试验区	1985	5.5	已有使用权,但没有土地证
黄花沟打草场试验区	1985	5.5	已有使用权,但没有土地证
扎格斯太旅游度假区	1999	1	已有使用权,但没有土地证

(锡林郭勒生物圈保护区核心区　苗河　提供)

锡林郭勒生物圈保护区所面对的土地权属的困扰为我们提供了一个值得思考的问题:维护公共利益必须收回土地使用权吗?作为公共利益的代表,保护区管理者的责任是维护所有资源利用者的共同利益,而不是简单地取代资源利用者的利益。用行政手段收回土地使用权实际上触犯了资源利用者的利益,只会加剧公共利益与个别利益之间的矛盾。我们面临的多数情况是在自然保护区建立之前土地权属已经确定,在必要和有条件的时候政府应当以有偿的方式取得土地使用权建立保护区。但是往往限于财政困难各级政府拿不出这笔资金。于是探讨在不改变土地权属的前提下建立和管理自然保护区成为一个现实的课题。对于是否必须收回土地使用权的问题,锡林郭勒生物圈保护区的实践已经做出了否定的回答:区内整体性的生态退化,使保护区 16 年来为取得土地权所付出的努力和所得到的收效显得微乎其微。在保护区的最新规划中(锡林郭勒国家级草原自然保护区管理局 1999)已经把几个重点核心区连接扩大为面积 4 000 km^2 左右的核心带,用什么样的思路解决非公有土地的自然保护问题,是保护区管理局的一个新课题。

6.2.6 与当地社会经济发展失去协调

资源利用者为了追求经济目标往往忽视生态环境和生物多样性的维护，因此人们通过建立自然保护区来解决这个问题。但是建立起来的自然保护区又容易在强调保护或者连自身建设都自顾不暇时而忽视与当地社会经济发展的联系。锡林郭勒生物圈保护区也处在这样的境况之中。然而，离开保护与发展的相互协调，问题能得到解决吗？

大多数保护管理者在代表公共利益行使职能时，面对的首当其冲的问题就是与当地发展的矛盾冲突。保护与发展实际上是一对孪生矛盾。如果没有明确地把解决这一矛盾作为目标，或者因各种原因没有能力去解决这一矛盾，保护管理者实际上无法实现公共利益的维护，也就否定了自己的存在。不少自然保护区陷在这种困惑之中。陷于这种困惑的保护管理者往往只强调加强法制，而忽视协调。其实这两方面都十分重要。而世界生物圈保护区与其他各类保护区的区别就在于她更加注重协调(UNESCO 2001)，因为她的目标是促进生物多样性的保护与可持续利用相结合。这也是为什么生物圈保护区强调实行开放式、参与式和适应式管理的原因(UNESCO 1995)。我们不妨在图 6-3 的基础上，在加上一个背景圈(见图 6-5)，表示生物圈保护区是将人与自然作为一个整体看待的：一个生态系统或区域要保持其自然价值的完整性，需要人与自然和谐相处。而人与自然的和谐在很大程度上取决于这一系统中的个别利益与公共利益的和谐统一，即通过资源利用者与保护管理者的协调相处，实现人与自然的和谐。这也是生态系统管理方法所强调的(UNESCO 2000)。

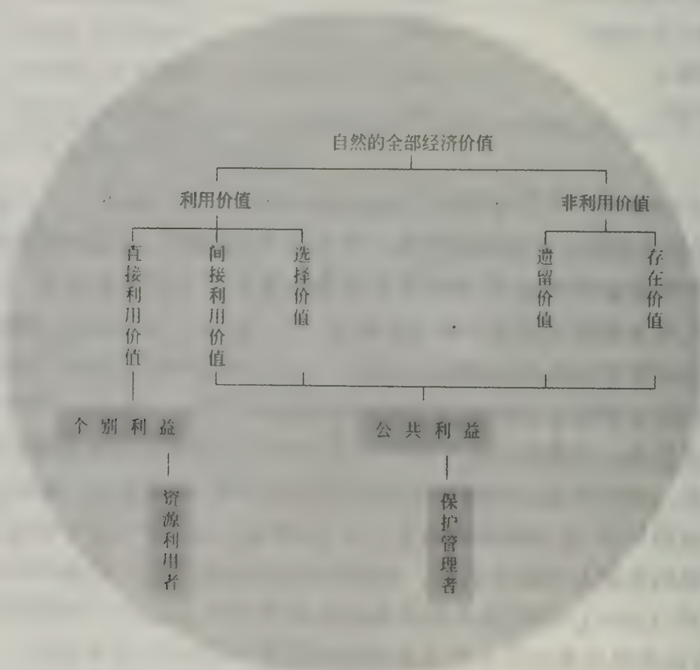

图 6-5 维护生态系统的完整性需要个别利益与公共利益的协调

锡林郭勒生物圈保护区出现生态系统退化的根本原因在于保护管理与社会利益之间和社会系统之间失去了协调,表现在下述几个方面:

6.2.6.1　目标集中在狭小的核心区,失去对缓冲区和实验区的管理

由于自身经费不足、土地权属困扰、法规不健全等等原因的限制,锡林郭勒生物圈保护区保护管理工作局限在面积十分有限的几个核心区的封围和管护,而对社区生产活动集中的大面积的缓冲区和过渡区却顾及很少。但是对核心区的威胁和破坏却都是来自核心区的周边地区,几个孤岛状的核心区和试验区的围栏不断被破坏,围栏每年需要修复1次～2次(见表 6-4)。16 年来用于管护核心区和 2 个试验区的资金为 91.26 万元,占全部日常运转费的 64.6%,其中用于修建围栏材料费 25 万余元,相当于保护区管理局一年的全部开销。然而,修而复始,几乎无效。保护区栽桩,牧民拔桩这一循环不已的过程,揭示了一个机制性的问题:资源使用者为什么可以不承担保护的责任呢?如何建立起"谁利用,谁保护"的共管机制呢?

表 6-4　1993 年以来保护区几处核心区及试验区围栏修复和屡遭破坏的情况

功能区	修复次数	围栏材料费(万元)	目前状况
查干敖包草原核心区	1		1993 年以前已完全破坏
海流特典型草原核心区	11	7.21	已遭破坏,呈开放型
陶乌音陶勒盖残遗云杉林核心区	13	4.78	已遭破坏,呈开放型
阿布都尔图山杨、白桦林核心区	13	4.2	目前良好
东台子退化草场改良试验区	7	3.92	1999 年后失修,围栏已丢失
黄花沟打草场试验区	3	5.35	1995 年春全部被破坏,至今未修
总计	48	25.55	

(锡林郭勒生物圈保护区核心区　阎云　提供)

本项研究于 2001 年对位于锡林郭勒生物圈保护区缓冲区或过渡区内的 19 个企业实体,包括牧场、工厂、矿业、度假村等的主管人员做了一项调查(见表 6-5),其中 63%的企业认为自己的生产活动对环境有影响,而却有 79%的企业没有受到保护区的任何管理和限制,有近乎一半的企业尚不知道自己位于保护区范围内。这发生在锡林郭勒生物圈保护区建立 16 年之后的今天实在发人深思,反映了保护区与社区脱节的严重程度。

表 6-5　对缓冲区、实验区内 19 家企业管理者的调查

问　　题	是(个数)	否(个数)	未回答
是否知道处在保护区范围内	10	9	
企业生产活动是否对生态环境有影响	12	7	
保护区的管理是否给你企业带来限制	4	15	
是否要求保护区加强管理	12	7	
是否有必要建立保护协调机构	12	2	5
所在的区域生态环境是否在退化	17	1	1
是否愿意在开发利用资源的同时承担对资源环境的保护责任	14		5

6.2.6.2 未能建立起协调机制

目前，锡林郭勒生物圈保护区范围内的十几家企业和锡林浩特市都是在按照各自的规划发展着，缺乏在保护目标上的协调一致。作为公共利益的代表，锡林郭勒生物圈保护区在制定规划的过程也没有听取区内资源利用者意见，更未建立听取意见的程序。无协调发展是目前锡林郭勒生物圈保护区内的重要问题。

在协调方面有这样几件往事：① 保护区建立之初，在没有专门管理机构的情况下建立了保护区与白音锡勒牧场联合管理机构，并在白音锡勒牧场设立了保护站，此联合管理机构存在了近10年，在1994年锡林郭勒生物圈保护区专职机构建立后自然地解体了（见专栏6-6）。之后保护区与牧场之间的沟通逐渐减少，隔阂在增加；② 1994年中国人与生物圈国家委员会组织对锡林郭勒生物圈保护区进行评估时，促成建立了锡林郭勒生物圈保护区科技协调组，中科院草原定位站和内蒙古大学作为保护区的科技顾问单位参加协调组。但是由于缺乏有效的合作机制以及保护区自身的困难，科技协调组有名无实，未能真正地开展工作；③ 有着15万左右人口的锡林浩特市位于锡林郭勒生物圈保护区范围内，尽管城市发展的许多方面，如能源、建材、肉食、旅游、休闲、环境等需求与锡林郭勒生物圈保护区发生着千丝万缕的联系，然而以把城市划在保护区里不好管理为由，成为保护区所做的规划至今未能得到批准的原因之一。如果当保护区与锡林浩特市协调管理不顺的时候，干脆做出将市区排除之外的选择，并未解决实质问题。两者之间在生态、社会、经济方面的种种联系并没有因为人为的区划开而停止。相反，随着今后的发展，两者之间的联系会更加密切。比如，锡林浩特市和锡林郭勒生物圈保护区都是国家发展旅游业的重点区域，旅游业将是两者更加密切相连的纽带，两者之间需要的协调会显得更加重要。以上几个例子都说明尽管协调与合作有利于公共利益，但是由于局部利益及各种原因，协调合作往往成为最难啃的一块骨头，致使它成为许多生态环境问题的深层原因。

专栏6-6 锡林郭勒生物圈保护区与白音锡勒牧场联合管理机构

1985年，锡林郭勒保护区成立之后在无专门管理机构的情况下，建立了保护区与白音锡勒牧场联合管理机构。当时的牧场场长兼任保护区管理处副处长，牧场生产科科长兼任联合保护站站长，保护站还另设两名专职人员。联合管理机构每年召开数次会议，布置工作，曾多次接待国内外学者专家来访。几个核心区都由牧场派人看护，付每人每月500元看护费，并先后修建保护站房屋一处和购置了摩托车、小四轮拖拉机各一辆，用于巡护和维修核心区围栏。1993年锡林郭勒保护区成立专职管理处。同年联合管理机构解体，联合保护站的房屋被卖给锡林浩特市工商局。

锡林郭勒生物圈保护区核心区　郝军　提供

本项研究对保护区内19个企业的调查（见表6-5）表明，其中近90%的企业感到生态环境在退化（许多感到退化严重），74%的企业愿意在开发利用资源的同时承担对生态环境保护责任，63%的企业要求保护区加强管理，63%认为有必要建立保护协调机构。这表明在生态环境十分恶化的今天，要求加强保护和协调的呼声成为主流。

2001年8月，盟公署做出成立“锡林郭勒国家级草原自然保护区管理委员会”的决

定。该委员会由 3 位副盟长和 14 个部门的领导组成。该委员会的成立是对锡林河下游流域保护与发展战略重新认识和思考的结果，是锡林郭勒生物圈保护区管理体制建设上迈出的重要一步，显示出盟公署领导开始从地区环境与发展的高度认识锡林郭勒生物圈保护区的作用。希望该委员会的成立将是摆脱利益冲突，走向协调发展的开始。

6.2.6.3　缺乏可持续产业

我们在做访问调查时发现，连续 3 年的旱灾和积累性的生态恶化给放牧畜牧业带来的致命的打击，同时也断绝了原来还可以作为补偿收入的采菇采药等经济来源。社区群众和领导都感到目前的发展方式已经走到了尽头，迫切需要找到新的出路，但又为没有其他的现成办法和思路而叹息，甚至对将来的设想也没有。在无奈中许多人寄托于来年的风调雨顺。在过去的时间里虽然眼看着草地逐渐退化，却没有早些下手寻找阻止草地退化同时又实现发展的途径，看来这是重要的教训之一。

锡林郭勒生物圈保护区范围内有着 4 个大牧场，这些牧场尤其是白音锡勒牧场有一定的技术力量优势和优质的草场资源，却长期经营着粗放的放牧畜牧业；近几年发展起来的几十家度假村，经营内容基本上雷同，缺乏对当地文化和自然特色的挖掘；保护区管理局经营的示范牧场曾经有过伏草青贮和饭馆冬春季供应鲜肉的实践，这些尝试对缓解草地退化同时又创出经济品牌着重要意义，但是保护区做这些事情主要是为了自身的发展和创收，甚至是为了市场竞争，而没有积极向社区传授和推广；社区群众中一些好的经验和探索，如牧民自发联合创办的“奥奇旅游牧村”就是在探求抗御自然灾害能力较强的新的发展出路，但是缺乏必要的扶持和指导；锡林郭勒生物圈保护区的品牌对促进地区可持续产业发展有着巨大的潜力，但是目前没有认真研究和加以利用，而仅仅被一些企业不规范地使用着。目前的这些问题和缺欠也正是今后的发展潜力所在。保护区管理局应考虑把更多的精力投入到扶持社区发展上来，扭转长期以来的资源粗放利用的方式，在保护区范围内形成的几项有特色可持续的拳头产品，这是保护与发展两方面利益有效的结合点。如果说加强法制管理是“堵”的话，扶持社区发展则是“疏”。疏导畅顺了，保护与发展的许多矛盾就会缓解，堵的任务自然就会减轻。

6.2.7　保护区管理机构职能偏离目标

从对图 6-5 的分析可以看到，保护管理者在维护公共利益的过程中主要是与资源利用者打交道，而“打交道”的核心内容有 2 个：执法与协调。因而，自然保护区的管理机构性质和职能的定位应当重点围绕这两个核心内容。但是我们许多保护区机构设置的缺陷恰恰就在这里。它们仅仅适于与自然打交道，一旦与人或部门即资源利用者打交道的时候就会遇到一系列体制上的不顺，尤其在执法和协调方面。

锡林郭勒生物圈保护区建立以来不断地在摸索和调整机构的建制。从 1985 年到 1994 年几乎 10 年的时间里锡林郭勒生物圈保护区处于没有专职机构，由盟城乡建设环境保护处代管的状态，队伍和管理都十分不完善，无法真正执行公共利益代表的职责。1994 年建立了专门管理机构，但实际上是自收自支的事业单位，1999 年后被定为全额拨款（仅 4 人工资）的事业单位（见专栏 6-7）。

专栏 6-7 锡林郭勒生物圈保护区机构沿革简述

1985 年 5 月 18 日，内蒙古自治区人民政府下文批复成立锡林郭勒自然保护区，保护区在行政上由盟行署领导，在业务上由自治区建设厅和畜牧厅的领导。保护区管理处设在盟城建环境保护处，城建处处长兼任保护区管理处主任。管理处下设“保护区管理站”和“草原生态监测站”，这两个站分别设在白音锡勒牧场生产科和盟环境保护监测站。

1994 年 3 月 21 日，锡盟机构编制委员会下文批复成立保护区专职机构“锡林郭勒草原自然保护区管理处”，属盟城建环保局领导下的准处级事业单位，编制 8 人，实行差额补贴，盟财政每年列支 1.5 万元差额补贴。自此保护区有了专职管理机构，但经费差额补贴并未执行，实际上保护区实行的是自收自支的企业化管理。

1999 年 6 月 3 日，锡盟机构编制委员会下文撤消原保护区管理处，成立保护区管理局，由盟城建环境保护局副局长兼任保护区管理局局长，全额工资编制 4 人，下设接待处和生产开发处两个经济实体，保护区的日常运转经费和 4 人之外的人员工资自筹。

锡林郭勒生物圈保护区管理局 苗河 提供

保护区管理机构作为事业单位性质的机构，适合于开展一些科研、监测、环境教育等性质的工作，而在执法和协调方面却总遇到名不正言不顺的问题。这就是为什么锡林郭勒生物圈保护区也尽力做了一些科研、监测和环境教育方面的工作，尤其是在经费严重不足的情况下，可以说是基本尽到了责任，但是用保护效果去检验的话却又明显表现出失职。这一矛盾现象的背后原因是保护区管理机构性质的定位不准确。

为解决经费严重不足的问题，锡林郭勒生物圈保护区先后建立了接待处、牧场、茶苑（饭馆）和旅游服务中心（见专栏 6-8）。

专栏 6-8 锡林郭勒生物圈保护区自我经营创收情况

实验示范牧场 建于 1988 年，经白音锡勒牧场同意无偿使用其第二分场的草场，从 4 个员工和 280 只羊起家，通过扩大生产的方式增加收入和扩展规模，到 1999 年发展到 18 名员工、2 000 只羊、200 头牛，并先后修建了办公室、职工宿舍、接待学者专家用房、库房、育肥圈、青贮窖、围栏等设施。1998 年至 1999 年间重新划分行政区界时，由于草场纠纷示范牧场的部分设施被邻县牧民砸毁，生产一度瘫痪。后又因白音锡勒牧场草场日渐短缺，于 2000 年将保护区使用的草场全部收回，加之其它原因保护区的实验示范牧场被迫撤消。

大自然接待处 建于 1986 年，当时从业人员 10 人，床位 40 余个。至 1999 年从业人员达到 23 人，床位达到近 90 个。十几年来大自然接待处的收入成为保护区管理局职工工资的重要来源。但是由于经营不善，设备陈旧老化，1997 年后效益开始滑坡，1999 年累积亏损 100 多万元，濒于破产。同年保护区管理局实行转制时，由下岗职工集体承包经营，以后每年上交保护区管理局承包费 20 万元。

大自然茶苑 是保护区建在锡林浩特市的一个饭馆，1995年正式营业。该茶苑是锡林浩特市

续专栏 6-8

第一个经营肥育童子羊的饭馆，羊肉由保护区的示范牧场供应。开始时效益很好，但 1999 年以后经营混乱，效益滑坡，当年 10 月随保护区机构改制，职工下岗，实行集体承包。以后每年上交保护区管理局 4 万元承包费。

旅游服务中心　始于 1991 年，当时由保护区与锡林郭勒旅行社联合经营一处蒙古包度假村。1995 年开始由保护区独立经营度假村，并投资购置了蒙古包和修建了厕所、固化路面、水塔、餐厅、展厅、商店、办公室、职工宿舍等设施。1999 年开始收取门票。近两年来每年接待游客 2 万左右。1999 年保护区机构改制时，旅游服务中心从由保护区管理科经营改为由派出所负责经营管理，自收自支，从业人员 4 人属保护区编制，每年实现利润 8 万元左右，上交保护区管理局承包费 2 万元。上交的承包费主要用于派出所人员和运转的开支。

锡林郭勒生物圈保护区管理局　阎云　提供

1999 年以前锡林郭勒生物圈保护区全部 50 名职工的工资都是靠保护区自我创收解决，创收人员比例达到 5/6，仅 8 人从事管理，而且也是终年忙于接待，主要领导人的精力 80%以上用在经营方面，保护区实际上走了一条企业化管理的道路。保护区管理局十几年来探索自养之路，尽管解决了一些经费问题，如表 6-2 所示 16 年累积创收用于保护的金额 113.86 万元，平均每年 7.1 万元，但是由于没有土地权属，经营创收能力和水平低下，管理与经营不分等原因，未能从根本上解决经费问题，反而背上了债务，1999 年累积欠债 146 万余元(苗河 2001)，同时陷入了与社区争夺利益的矛盾，在很大程度上分散和削弱了保护管理工作。鉴于上述原因，1999 年以后保护区管理局正在逐步将管理与经营分离，目前管理岗位职工 19 人，已争取到 5 人的工资由盟公署发给，其余 14 个职工包括公安派出所 4 名人员的工资和所有运行费用仍然靠自我创收解决，创收人员的比例约占一半，保护区管理局主要精力仍然不能集中于管理。保护区并非一概不能通过自我创收来解决部分保护经费的来源，但是这需要一定资源条件和健全的管理体制。锡林郭勒生物圈保护区十几年来在自养道路上未能获得成功的探索，为深入分析和认识自然保护区创收自养这一事物提供了重要线索。

虽然锡林郭勒生物圈保护区管理局做了许多探索和努力，但是由于机构设置上的缺陷，在关键的执法与协调方面却无力发挥作用，即无力解决所面临的实质问题。连同前述的多方面原因，尽管有代表公共利益的保护区管理机构存在，而该地区的公共利益却未能得到有效的保护。

6.3　构筑新的管理体系

锡林郭勒生物圈保护区内生态系统退化的核心问题是公共利益与个别利益之间的关系没有处理好，而造成问题的原因是多方面的。这些原因长期相互作用形成了一个系统，单项措施，例如仅仅增加经费投入或仅仅加大执法力度都难以全面解决问题，所需要的对策必须是综合的，是一个创新的管理体系。新的体系应当以解决好两个利益之间的关系为主要目标。我们建议为新体系确立一个明确的宗旨：即利益共享责任共担，可以称之为

"共同利益责任体系"。这一体系将是开放的，可以包容更多利益者的参与，使他们在利用资源的同时担负起保护的责任，并将适应新的发展不断进行调整，即开放式、参与式和适应式的管理体系。现在就让我们一同来探讨和构筑这样一个体系：

6.3.1 确立保护与发展结合的目标

锡林郭勒生物圈保护区建立之初为保护整个锡林河下游流域而划定的区域范围应当坚持，不应当"削足适履"，即由于现行管理体制上的障碍而收缩和改变。应当根据锡林河下游流域十几年来发生的社会、经济、尤其是生态上的变化，十分明确地将生态系统恢复和在恢复中促进社区可持续发展列为重要的管理目标。如果 16 年前的重点目标是生态系统保护的话，而今天促进该地区生态系统的恢复无疑应当是锡林郭勒生物圈保护区的重点目标，即锡林郭勒生物圈保护区已经属于生态系统恢复类型的保护区了。今后一段时期内一切管理对策和措施都应围绕这一重点目标，从小面积核心区的保护扩展到整个区域生态系统的治理和恢复。而生态系统的治理和恢复与社会经济及社区生产生活密切相关。作为生物圈保护区，评估其成效的依据不仅是核心区受到保护的状况，同样重要的是缓冲区和过渡区内资源保护和利用的状况。因此促进社区的可持续发展也应当列为锡林郭勒生物圈保护区今后的重要管理目标之一。生态恢复与可持续发展这两个目标实际上与整个锡林郭勒盟地区今后的发展目标是一致的，锡林郭勒生物圈保护区的重要作用将是在整个地区提供恢复治理和可持续发展的示范。实现保护与发展结合的目标既需要地方政府将保护区作为地区发展棋盘上的一个重要棋子来考虑，也需要保护区管理局及其主管部门将保护区工作融入到整个地区的生态、社会、经济建设中来。

6.3.2 建立有力的协调机制

不久前成立了由盟公署直接领导的保护区管理委员会。该委员会由盟公署的有关职能部门、地方政府和行业等 14 个单位的领导组成，并明确规定了委员会的职责，包括监督执行国家有关法规，协调矛盾纠纷；在居民搬迁、旅游开发等重大问题上做出决策，提出功能区调整意见，引进生态建设项目和指导制定管理规划等等。这些职责的针对性很强，基本涵盖了锡林郭勒生物圈保护区面临的问题和需求。委员会的成立确立了政府对这一区域的生态恢复治理的责任和主导作用，填补了这一区域原来所缺少的有力的协调机制，这将是新体系中的核心部分。建议管理委员会除了加强政府的主导作用以外，广泛吸纳区内资源利用者，如石油、煤矿、沙石场、砖瓦厂、旅游经营实体、牧民代表，以及长期在这一区从事科研教学单位，如中科院生态定位研究站和内蒙古大学的代表参与委员会的组成，逐步形成包容广泛的共同利益责任的合作协调机制。

6.3.3 保护区管理机构的确切定位

锡林郭勒生物圈保护区 16 年的经历告诉我们，欲管理好公共利益，一个重要的前提

条件是公共利益代表者自身职能的到位，这也是关系到新体系能否建立起来的关键。建议保护区的主管部门和当地政府：

(1) 将锡林郭勒生物圈保护区管理机构的性质从事业单位改为政府职能机构，实行公务员制，纳入政府财政预算。使保护区管理局从经营自养状况解脱出来，真正担当起公共利益代表的角色。保护区管理局同时兼职上述的保护区管理委员会的日常机构，以此加强委员会的决策反馈机制，使委员会的作用落到实处。

(2) 保护区管理局的职责从管护转变到监督和协调两个最关键的方面上来。在监督方面，将管护责任通过法规、政策、合同、契约等方式落实到资源利用者身上，使他们在享用资源的同时担负起相应的保护管理责任。这样保护区管理机构将从自己管转变为别人管我监督的方式，即不需要取得土地权属照样能施加管理。而且这样只需要一支精干的管理队伍就可以了，符合政府机构精简高效的原则。在协调方面，机构设置到位后保护区管理局应特别注意在扶持当地可持续发展方面增加力度。这方面有大量的协调工作需要去做，如为资源利用者提供信息，建立沟通、参与和激励机制等等。当保护区管理机构的自身生存问题都没有解决的时候，协调工作的重要性很容易被管理者自己忽视。但这是真正管理好这一包括两个城镇和诸多牧场、企业的大面积保护区所面临的需要。

6.3.4 把握恢复生态系统的主动途径

如何有效地遏制生态退化和恢复家园成为当地人们普遍关注的问题。锡林郭勒生物圈保护区内已经采取了一些治理恢复措施，如减少牲畜头数、划区轮牧、把严重退化地段围封起来飞播草籽等等。这些措施多是从畜牧业发展角度出发的，即仍然是从开发自然的直接利用价值角度出发的。然而，今天值得我们记取的严重教训是我们不能只盯在自然的直接利用价值上而再次出现失误，而必须着眼于生态系统服务功能在内的自然的全部价值的恢复和维护。建议保护区管理委员会和保护区管理局选择从扩大保护区核心区入手，逐步恢复生态和培育建立可持续的新产业，这是着眼于地区长远利益和生态安全的对策。理由是：

(1) 这一地区的草地植被类型在生物多样性方面具有重要的世界和国家意义，保护区内的核心区如海流特典型草原核心区就是这一地区植被的代表和精华部分；

(2) 目前这些核心区面积太小，起不到生物多样性保护和为地区提供生态服务功能的作用。扩大核心区可以海流特典型草原核心区入手；

(3) 自然保护区的核心区的目的之一是保持生态系统的自然过程。被扩大的核心区将充分依靠自然力恢复生态系统，这是成本最低效果最佳的恢复途径；

(4) 目前保护区的核心区及周边地区植被破坏尚不十分严重，容易恢复。扩大核心区便于与培育和发展新的产业，如打草业和生态旅游业结合起来进行规划；

(5) 优先扩大核心区的做法与目前把治理重点集中在严重退化区域的做法不同，后者实际上沿袭的是“先破坏，后治理”的被动做法，而且容易导致目前尚好的草场面临更多牲畜的压力而继续退化。扩大核心区是保护与发展在战略上争取主动的办法，是保住草原这一自然历史遗产和从根本上步入可持续发展途径的必然选择。当然，核心区的扩展

需要与其他治理恢复措施以及新的产业发展配合起来才可行，如与减少牲畜头数、休牧、生态移民、集约经营、生态旅游发展等。

扩大核心区需要在现有核心区的基础上修改和重新划定边界（Thwaites 1998），将被扩大的核心区应当是现有核心区中具有典型性和代表性的。

6.3.5 需要解决土地权问题的新思路

探讨非公共土地的生态系统和生物多样性的保护是国际性前沿问题之一，许多国家和地区在根据各自的情况制定相应的保护对策，如澳大利亚从法规和激励政策两个方面入手鼓励私有土地实施生物多样性保护。目前锡林郭勒生物圈保护区内的土地政策是土地使用权归牧民或牧场，几十年不变。保护区管理局应当突破思路上的框框，在正视和尊重土地权属人利益的前提下，采用新的办法扩大和管理核心区。这里提出两个扩大核心区的选择方案：① 迁移核心区内的居民，由政府给移民以生态补贴和安排新的就业，土地使用权转移到保护区管理局。实际上是土地使用权的有偿转移，而不再是无偿征用。此办法比较适于草场退化相对严重的地区，那里的居民已感到难以生存下去，有搬迁的意愿。② 由当地居民看护核心区，由政府通过保护区管理局付给一定的看护费用。此办法不改变土地权属，土地权属所有者从草场利用者变为核心区看护者，实际上是保护管理力量的延伸和保护责任共同承担的一种形式。其好处是土地权属不变，保持草场承包政策的连续性，遵循的是"谁使用，谁保护"的原则，使当地居民成为保护管理的主人。这种方式还可以与建立打草场和发展生态旅游结合起来，例如在核心区周围划定打草场，周围居住的牧民在保护自己的打草场的同时也保护了核心区。还可以借鉴奥奇牧村的经验发展牧村民俗旅游，在核心区周围建立牧民经营的牧村民俗旅游点（见图 6-6），这些牧村民俗旅游点同时负责看护核心区。这样使生态保护与当地居民的生计和发展联系起来。此种方案是在不改变土地权属的条件下探讨共同管理核心区的模式，具有普遍的意义。

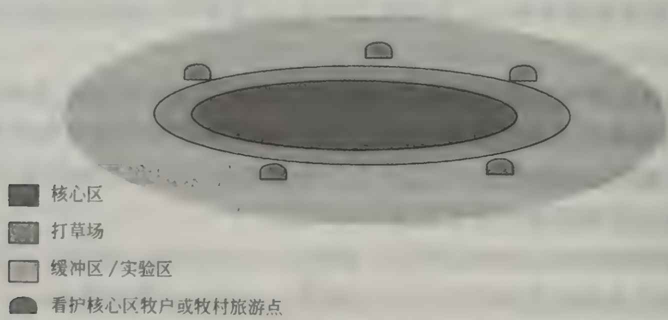

图 6-6 核心区看护、打草场、牧村旅游结合示意图

以上两种办法都可以避免与土地权属者的矛盾冲突，还可实现参与式的保护管理，而且在恢复和治理过程中促进新的可持续产业的发展。目前实施这样方案既有必要性又有有利条件：① 扩大保护区核心区是积极的治理措施，与当前国家在退化干旱地区的生态治理计划相吻合，资金可以从治理经费中解决，这是以前不敢奢望的条件；② 广大牧民和

干部已经亲身感到恢复生态的迫切性,可以得到广泛的支持;③ 这样的生态恢复办法成本最低;④ 逐步培育和形成新的可持续的产业,使人们看到希望;⑤ 形成"共同利益责任"的保护发展新模式,对整个地区具有长远的示范意义。

6.3.6 加强法治管理

包含两个城镇和多个牧场、企业的锡林河下游流域,其生态系统和生物多样性保护所涉及的行业和利益十分广泛和复杂。法规、政策、规章、制度要有很强的针对性和细化才能有效发挥作用,比如草场权属者的权益和必须承担的保护责任、旅游经营者必须承担的环境保护责任、扩大核心区的土地管理依据、对行区内各业行为监督和奖罚的规定、可持续发展产业激励政策的制定和实施等等,都是锡林郭勒生物圈保护区管理局面对的需要有细则化的法规为依据来管理的事务。有了健全的法规,保护责任才能具体落实到不同的资源利用者,保护区管理才可能从被动管护转为依法监督。

6.3.7 建立总体规划制度

总体规划是平衡和调节保护与发展的重要手段。锡林郭勒生物圈保护区内各个企业、社区、市镇的发展规划都应纳入在这一区域的总体规划中来,在统一的目标和框架下寻求各自的发展。锡林郭勒生物圈保护区管理委员会正是此项工作最理想的牵头者,她具有足够的权威性和协调身份。因此总体规划的制定、执行和评估应当列为保护区管理委员会的重要工作内容。总体规划的制定和执行过程也是参与和协调的过程,所制定的总体规划将是区内各市镇、企业、单位共同利益和责任的集中体现。许多保护区曾设立的联合管理或协调机构成效不甚明显,与没有建立总体规划制度或没有与总体规划制度相联系有一定的关系。总体规划既是保护区管理局实施协调的手段又是检查监督的依据。

6.4 留下的思考

20世纪70年代以后自然保护区全世界发展迅速,保护区所涵盖的内容也较之先前要广泛和复杂得多。锡林郭勒生物圈保护区的经历带给人们的启示远远超出人们对自然保护区的传统认识和理解,超出自然保护区本身的管理范畴。从我们的研究过程和结论中,至少可以获得这样几点思考:

(1) 保护区面临的真正挑战在于建立后的管理过程之中,锡林郭勒保护区建立16年了,过去的16年正是国家和所在地区的社会经济发生巨大变化的时期,锡林郭勒保护区的管理未能找到随着变化着的环境而需要采取的相应的政策依据,甚至连自身的生存问题都未得到解决,这样的保护区如何发挥应有的作用?这样的情况是个别的还是具有普遍性?锡林郭勒保护区既是国家级自然保护区又是世界生物圈保护区,有关的政府部门和机构应当对此做些什么?

(2) 保护区与其所在地区的社会、经济、生态的状况息息相关,即地区发展离开保护

区会失去基本的生态安全,保护区脱离地区发展必然走上孤岛化。生物多样性保护和可持续发展的实现需求向习惯现存的保护与发展相分离的管理体制提出了挑战,自然保护区的管理不在体制上有所创新的话,将于事无补。在我们即将完成这一课题研究的时候,我们开始面对这样一个问题:我们提出的体制创新的建议能够被付诸实践吗?或者是说,如何进行体制上的创新?推动这种创新的主要动力在哪里?在政府,还是在保护区管理者,还是在当地社区?

(3)在生态脆弱和退化的干旱地区,扩大保护区核心区或建立新的自然保护区可以成为维护恢复生态环境和发展经济的重要手段和途径。目前一些地区实行休牧围封,实际上是一种保护区的形态,可以通过社区参与的模式来管理这类保护区。并以此为基地在恢复和保护生态环境的前提下探寻可持续的途径重新振兴经济,带动地区发展。这样做虽无成功经验加以证明,但是教训提示给我们这样的思路,这也是世界生物圈保护区所倡导的思想和理念。与锡林河下游流域面临同样问题的地区是否也应当考虑把建立保护区作为地区可持续发展的一个重要手段呢?是否能够进而把这些保护区连接成片,形成生态屏障和生态型发展基地?这对西部开发能否是一个有益的思路?

(4)决策层在生态治理和恢复地区选择建立保护区的时候,应当从整体区域角度考虑恢复、保护和长远发展的布局,在禁牧围封生态破坏地区的同时,应当考虑选择保留尚好地区为核心区保护起来。否则目前生态状况尚好的地区也将失去。与其在彻底破坏之后建立保护区,不如尽早主动建立,这样损失和成本要小得多。这实际上是将失败的教训优先用于尚未失败的地区,避免重复老路,是真正接受教训的做法。在目前大规模投入生态恶化地区的治理和建设的时候,是否别忘记以更低的投入就可以保护尚未遭到破坏的地区?

(5)草原类型自然保护区的管理应当紧紧针对其生态、社会、经济状况和畜牧业等生产活动的特点,在野生动物大量消失的情况下,核心区可以考虑有控制的放牧和打草利用,以维持生态系统结构与功能上的平衡,在遇到重大灾害的时候,还可以显示出保护区的抗御能力。然而锡林郭勒生物圈保护区却因为固守核心区严格排除人为干扰的原则,反而落到孤岛的结果。这一现象再次提出了这样一个问题:是否能够尽快对自然保护区实行分类管理和出台相应的法规政策?

第 7 章

锡林郭勒生物圈保护区的协调管理

7.1 前言

由于这份报告的其他撰写者已着重介绍了锡林郭勒生物圈保护区的位置、面积和重要性，故本文将就如何改进该保护区与其周边地区的协调管理提出一些初步的意见和建议。然而，这里首先必须介绍一下当前急需解决的主要问题以及这些问题所牵涉到的方方面面。这些问题组成了一个复杂的方程式，但我们必须设法解开它。若要解决草原退化的问题，有关各方必须承认这样两个现实。第一，各利益相关者必须接受当前草原所面临的危机和引发这些危机的真正原因。第二，有关各方必须负责对草原进行长期保护并确保其健康状况。若有关各方不能接受以上两点，减缓草原退化的努力则难以为继，亦无法恢复草原生态环境。

自然，引起草原退化的真正因素还将继续存在下去。有些部门认为这些因素只是暂时的或短期的趋势，是由于恶劣的气候条件或近年来牧群数量不断增长而造成的。这种说法如出于那些不想对草原退化负任何责任的人们倒也作罢。20 多年来，草原研究人员和一些管理人员一直关注着草原生产力持续下降的问题。他们不断呼吁有关部门采取行动遏制这种不断退化的势头。然而，他们的呼声被提高生产和增长经济的要求湮没了。草原退化的现象不是一夜间出现的，而是逐渐形成的。只有那些对草原的健康状况漠不关心或在草原地区生活时间有限的人才不会重视这个问题。如这份报告的其他作者所述，锡林郭勒草原的早期退化尚属缓慢过程，可近十年来，草原退化的速度和范围有了明显的增长和扩展。这种退化已在草原某些地区造成了不可挽回的损失而几乎不可能在短期内修复。而其他许多地方的草原退化情况也许可以挽回或至少能得以稳定。但是要知道一朝一夕是无法改变现状的。即便草原治理恢复工程现在就开始，也得花 20 多年的时间才能完成。

“生态系统”这一概念为解释草原退化的原因以及谁应该对此负责提供了依据。要充分了解生态系统的含义就意味着必须了解在锡林郭勒草原及周边地区进行的各种经济活

动对草原产生的长期影响，以及这些影响之间的内在联系。有些影响是积极的，有些影响是消极的；有些影响是直接的，有些影响是间接的。因此，重要的是不要只看到人口和牲畜的增长、当前的放牧方式、牧民和牧场这些表面问题，而要认识到草原不是一个孤立的岛屿，而是一个动态的生态系统的一部分，它已远远超出了锡林郭勒盟的行政管理范围。为阐明这一点，蒋高明在他撰写的文章中强调了锡林浩特市的健康发展必须与其周边环境相适应的重要性。在另一篇文章中，韩念勇指出了认识草原生态系统的价值对锡林郭勒地区可持续发展的重要性，而不是把生态系统只当做资源来开发利用。一个典型的负面例子是产生于锡林郭勒地区的沙尘暴，其强度、面积和出现的频率都在不断增加。这些沙尘暴不仅刮走了草原重要的表层土壤，使土地荒芜贫瘠，而且影响了相邻地区的经济和生态环境，最明显的是北京和天津。沙尘暴甚至能抵达朝鲜半岛和日本。卫星图象和土壤检测显示这些沙尘暴甚至还抵达北美。上述事实当然不是什么值得骄傲的事情。沙尘暴每出现一次，人们便意识到离修复草原又远了一步，更困难了一步。然而，另一个不那么明显却可能更紧迫的问题是草原动植物的灭绝。这一危机对草原生物多样性的影响现在大多还是未知数，但已有迹象表明该地区的土生动植物的前景非常黯淡。

承认草原作为一个生态系统而存在，尤其是超越了行政管理范围或传统上认为的职责范围而存在，那么一个新的责任图就可以画出来了。锡林郭勒盟地方政府以及各有关部门是解决这个问题至少是缓和这个矛盾的关键。当地政府和有关部门应承担主要责任，帮助建立协调管理的方法以克服这一危机。但是，责任不仅仅是当地有关各方面的，它还延伸到北京，中国的首都。中央政府已承担了一部分责任，通过开展各种项目提供拨款和技术支持。在过去十年中北京愈来愈重视改善和保护其脆弱而独一无二的环境。这是值得高度赞扬的。然而，由于在过去二十年的改革过程中，中央政府将权力下放给了各级地方政府，因此中央政策在执行效率上受到限制。鉴于这个原因，中央政府应在最合适的地方发挥其作用，特别在提供技术、经济支持与指导方面。不仅如此，北京还需保证这种支持是以最快、最有效的方式提供的，因为中央政府易于获得国内外的最新发展动向。这些信息有可能为锡林郭勒面临的挑战提供解决办法。

在这份报告中，其他几位学者已经指出了锡林郭勒草原退化的主要原因，并提出了一系列短期和长期可以克服或至少减缓这种退化的方法和途径。草原的行政管理机构和有关各方应慎重考虑所有这些建议。但是，在可能做出改进或开始处理这个危机之前，有必要对现存的管理结构、组织以及有关各方之间的关系重新做出评价。只有如此才可能实现锡林郭勒草原的修复。目前，有关各方在行动时极少相互协作，更不用说彼此征求意见了。缺乏交流与合作的工作方法，很大程度上是官僚管理体制的产物。目前的官僚管理体制已形成了一种违反生态系统常规的、封闭的和有限的管理方法。每个部门局限于自己的权力范围和管辖范围之内。若各部门间存在交流与合作的话，不是因为当地政府施加了强大压力，就是各部门有着共同利益或领导人彼此关系密切。这里的后一个因素值得注意并需加以进一步说明。共同利益在这种情况下通常是指为双方提供直接的经济或政治利益。这种关系的持久性难以得到保证。事实上，一旦经济或政治利益消失，这种关系通常也就不复存在了。因此，如果不对当前的官僚体制进行改革，就必须利用现在的决策过程、思想和工作方法来进一步加强环境保护。毫无疑问，现在和今后许多年内，这些

地区将继续以经济为主导。因此这份报告适时提出建议,强调利用不同的经济手段减缓草原的退化并加强对草原的保护。没有实际的经济利益,大多数建议将得不到地方领导的关注,更不用说牧民们了。许多牧民在草原上生活并不十分富裕。事实上,牧民们很大程度上是迫于经济的压力才竭力从草原上获取短期利益而不顾这种行为会带来的草原严重退化的后果。这份报告中的建议若想得到重视,就必须致力于解决生活受到草原退化严重威胁的牧民的生计和发展问题。

以下是一些非常笼统的建议,也许反映了笔者对锡林郭勒草原当前普遍存在的问题的复杂性认识非常粗浅。笔者在这篇文章中陈述的观点是基于 2001 年在锡林郭勒地区所做的两次实地考察以及对与这一课题有关文献资料的阅读。不管怎么说,这些只是初步意见。很显然,在找到明确的解决方案之前,还需作更多调查了解。关于这个问题的紧迫性已毋庸赘言,因为毫无疑问现在必须找到解决方法并立即付诸实施。当然,无论哪种模式被采用,它都应有足够的灵活性以适应环境和条件的潜在变化,而不要被当作修复草原和发展该地区的完整的处方。本文的目的旨在对一些最明显且需要解决的矛盾进行反思。

下述建议大致分成 7 类:管理、经济、生态旅游、科技和监督、土地改革、自然保护区管理局、自然保护区范围以及一些总体上的问题。这样归类并无轻重之分,只是有助于阐明观点而已。最后还要声明,这些建议并非完美,它们只是复杂画面上的一个部分而已。

2001 年 8 月,成立了以锡林郭勒盟党委副书记、常委副主席苏和为领导的锡林郭勒国家级草原自然保护区管理委员会。这一行动应得到高度赞扬与支持。这是向前迈出的重要一步。它保障了以更加统一和协调的方法对锡林郭勒草原进行管理,并力图解决自然保护区管理局所面临的一些严重问题。然而,有一点非常重要,那就是保护区管理委员会应提供公开讨论的机会,就各种迫切的问题进行切实的讨论和辩论。委员会应宣传解决草原退化的新思维、新方法。委员会还应根据有关各方的需要,制订一个协调的总体规划,采取必要措施以改变目前各部门的消极态度,刺激更多积极的活动,增强计划的一致性。此外,管理委员会由于负责协调工作,所处位置正有利于向中央和国际机构争取技术和经济援助。委员会责任重大,希望所有成员认识到这个任务的重要性和迫切性,以及为中国其他草原地区的修复提供借鉴。锡林郭勒草原只是整体的一部分。因此,锡林郭勒必须向中国的其他部分证明什么是可能做到的,证明通过协调和合理的管理,草原的健康发展与繁荣将完全可能实现。

7.2　保护区需加强的工作

7.2.1　管理

(1) 确保当地政府在政治和经济上对环保工作的持续支持。

(2) 上级政府部门应鼓励下级政府部门互相沟通和协商,并鼓励他们通过与自然保护区建立对话渠道,直接就保护区的管理工作进行沟通和协商。

(3) 增加透明度。有关各方相互交流各自最主要的问题,并清楚说明解决这些问题

所需要采取的行动。

(4) 盟政府应征求有关各方的意见,制订一个《草原管理总体规划》,指导各部门的工作。这个总体规划应兼顾经济利益和生物多样性的保护。

(5) 坚决支持新成立的锡林郭勒国家级草原自然保护区管理委员会,密切注意其发展动向,确保委员会按既定方针运作。

(6) 鼓励与牧民不断交流,使他们理解可能进行的改革并遵守有关规定。

(7) 对政府和牧民的沟通进行间接的监督,以保障一个更加开放的管理方法。

7.2.2 经济

(1) 将锡林浩特市的发展直接与草原的修复联系起来。锡林浩特市的健康发展有赖于一个兴旺的草原。

(2) 建立一个经济制度。运用此制度来减轻牧民的生存压力和草原所承受的经济压力,补偿牧民因保护草原而遭受的损失。美国、加拿大和澳大利亚都建立了这样的经济制度来保护草原。如锡林郭勒盟能学习这些海外经验并采取适当措施,定能从中受益。此外,国家林业部、财政部、中国人民大学、农村发展协会和世界银行已在全中国对自然资源管理、保护和土地所有权等问题开展了一系列调查研究。锡林郭勒盟应了解这些调查结果是否对本地区适用。

(3) 将锡林郭勒草原的修复计划与全国的草原修复战略结合起来,以保证长期得到政治上、行政上和经济上的支持。

(4) 调查了解从国内外获得拨款的其他途径,继续对草原进行研究,保护锡林郭勒代表性草原的生物多样性。

(5) 对草原的生态服务价值进行评估。这项工作应由内蒙古草原生态系统定位站与有关高校和研究机构合作进行。

(6) 对愿意从事其他对草原影响较小的经济活动,或愿意从事多种经营的牧民,政府应提供低息短期贷款。请参阅本书中的“生态旅游”部分。

7.2.3 生态旅游

(1) 旅游局应与盟政府和其他有关部门一起制订计划使当地牧民参与生态旅游业。

(2) 在发展生态旅游时,应让牧民多受益。在可能情况下,对牧民进行培训,让他们当导游或经营旅游点。

(3) 旅游局应在盟政府支持下,对当地奶制品和其他副产品的生产商开展教育活动,取得他们的支持。而支持者得到的回报是可以用自然保护区的名义对他们的产品进行广告宣传。还可以组织召开行业会来了解对此类方案的支持程度。

(4) 在锡林浩特开设培训课程,培训愿意从事生态旅游的牧民。课程应覆盖建立这样一个生态旅游点所涉及的各方面内容,使建立旅游点对环境的影响减到最低限度。

(5) 向愿意从事生态旅游的牧民提供低息短期贷款,无论他们是改变了自己的生产

方式还是仅以此作为副业。贷款应直接用于进行旅游宣传和参加上面提及的生态旅游培训课程。

7.2.4 科学与监督

(1) 进一步加强内蒙古草原生态系统定位站和自然保护区管理局的关系。

(2) 自然保护区管理委员会中应至少吸收一名内蒙古草原生态系统定位站的科学人员，以保证委员会充分了解当前草原退化的问题和原因。

(3) 对草原生态系统作调查分析，为确定重点保护区作好准备工作，这些保护区将由自然保护区管理局和牧民合作管理使用。

(4) 对国内外可使草原持续利用的模式和机制以及草场资源的协调管理模式进行可行性研究。

(5) 培养和巩固国内外关系。

(6) 终年对草场进行调查和监督。

(7) 内蒙古草原生态系统定位站应与内蒙古的高等院校协作，对草原的生物多样性进行评估，制订生物多样性地区的保护计划，最终制订一个生物多样性战略行动计划。

(8) 内蒙古草原生态系统定位站应加强对社会科学的研究。该站的大部分研究似乎都集中于发展更好的人工草场。尽管这样能增加收入，减少草地退化，但是草地的质量并不是引起退化的原因。况且，人为地给土地定产量是不可行的。因为这个定量必须灵活，既要考虑到锡林郭勒地区各种不同的环境，也要考虑到牧民不同的放牧习惯和管理方法，更不用说气候变化的因素了。因此，研究站应扩大研究范围，重点研究和开发能帮助牧民生存的其他经济制度。

(9) 帮助当地牧民改进放牧习惯与管理方法。

(10) 研究当地土生牧草种类，寻找可能的替代品，如谷物、药材、饲料等。

(11) 密切注意现有的人工草场，对新的牧草品种和新人工草场的开发实行监督，确保新的牧草不影响到原有草类的生长和生物多样性。

7.2.5 土地改革

现有土地使用权的规定似乎只加速了草原的退化。需要探索新的方法，让牧民在长期保护草原的同时受益。值得考虑的方法包括：

(1) 保障土地使用权和使用期限。

(2) 土地私有化。

(3) 签发有效期为 50 年的土地使用权合同。合同中附有对草原和土地的保护条例。

(4) 减少土地再分配，让牧民有稳定感。

(5) 允许土地使用权的转让，给牧民提供自由选择的机会。

(6) 在某些重点保护地区的土地使用合同中增加土地保护条款，同时对使用人提供适当补偿。

7.2.6 自然保护区管理体制的改革

(1) 尽快实行必要的机构改革。明确自然保护区管理局对新成立的盟环保局直接负责的关系。

(2) 确定保护区管理局的主要任务,明确需要采取的切实行动及其行动依据。这一信息应及时转达自然保护区管理委员会。

(3) 自然保护区管理局局长不应像现在这样同时身兼二职。

(4) 终年对自然保护区实行管理。冬季往往是草原退化最为严重的季节。同时,冬季也是同当地牧民接触,讨论合作管理的好时机。

(5) 立即解决与派出所有关的问题。将派出所迁至白音锡勒,或受盟环保局领导;或受盟公安局领导,附属白音锡勒公安局。后一种方案似更为可取,因为它明确上了下级关系,而且便于该所与当地警察和老关系进行沟通。这个方案需要在该所设置两个全职警察,与当地牧民、牧区、白音锡勒牧场及其附属企业一道工作。在天气较暖的月份,警员们可同保护区管理局一起工作,并为扎格斯太湖站提供帮助。

7.2.7 扩大化自然保护区的范围

应扩大自然保护区重要地带的边界,扩大后的区域应包括至少一半甚至是全部的相邻牧地。如有必要,可以考虑在严重退化地带以补偿的方式进行移民(这只能作为下策)。被迁徙的牧民可与自然保护区管理局和政府签订合同,他们对自然的保护和监督可得到补偿。补偿金额应根据上述经济制度来确定。这个经济制度的基础是有关地区生物多样性的程度和牧民的投入程度。合同使牧民在寒冷季节可能得到更好的牧草供应和住宿。由于前两年牲口数量会减少,有可能需要为某些牧民提供低息贷款作为补偿,这也是对他们生活的一种保障。这样的项目需要采取下列措施:

(1) 对牧民开展教育活动,说明搞这样一个项目的原因和可能产生的结果。

(2) 在牧民和自然保护区管理局之间建立信任和沟通渠道。

(3) 考虑向已签署了合同的牧民预付环保费。

7.2.8 其他一些问题

在采取上述任何行动之前有一些问题必须解决。这些问题大多与自然保护区管理局能否在力所能及的范围内对他们的工作负起责任有关。

(1) 利益间的矛盾冲突并不是很严重的问题。值得注意的是引起这些矛盾的原因。这些矛盾的原因在于保护区各部门和实体的发展是在无整体规划的情况下进行的,它们还没有开始走向协调发展。

(2) 笔者对各政府部门是否能立即着手处理草原退化的问题信心不足。我采访过的许多领导知道草原退化的问题,但不愿对此承担任何责任。不是推脱气候引起的,就是说

这是相邻地区的问题，或者推脱不在他们的权力范围和管辖范围之内。如果这种态度继续盛行的话，不久将没有草原可供他们管理了。

(3) 时至今日，自然保护区的许多重要地带仍与周围地区一样退化严重，有些甚至比周围地区退化得更严重。对此，保护区管理局应承担部分责任。如果他们不能证明自己能有效地管理和保护草原，那就没有人愿意扩大保护区重要地带并将管理权有效地移交给他们。因此，保护区管理局必须克服困难，开辟新的渠道，提高管理效率。当然，事情并非如此简单，在其他方面也需作重大改变。但如果管理局自己不作努力的话，那草原重点地区和代表性地区的保护根本无从谈起。

(4) 目前保护区管理人员士气低落。除非他们振作精神，否则难以有效地开展工作。这并非易事，但管理人员仍可在力所能及的范围内独立做一些工作，或与有关部门、牧场和牧民一起合作。

(5) 自然保护区管理局若不制订一些基本的实际工作计划，那将得不到任何重视。

(6) 对于目前的状况，我们很难做出精确的估计。最根本的问题还是人为造成的。各部门之间缺乏良好的关系与合作。因此，主管部门有责任来改善这些关系。

7.3　结论

尽管大家都本着良好的愿望，但草原退化的危机并没有能够很快生效的解决方法。草原不会一夜间恢复到她的“黄金时代”，沙尘暴也不会一夜间消失得无影无踪。我们只能采取措施，逐渐延缓草原的退化并逐步恢复草场。但所有这一切只有在主管部门重新评价了他们对草地资源利用的方式和方法后才会发生。这需要政府各部门采取一种统一的协调方法。这种方法必须开放、具有灵活性，能在今后长期内使草原退化的速度和程度降低。不仅如此，除了必须改善现有的管理体制，还必须进一步懂得如何处理这个危机。只有人际关系得到改善，彼此建立信任、理解和合作，草原的保护才可能开始实行。新的、活跃的想法、新的制度和工作方法应得到考虑和尝试。如果能发挥锡林郭勒草原现有的优势，克服不利因素，则不仅草原本身会繁荣，她的人民和整个锡林郭勒地区都会兴旺发达。因此，当今的领导人应抓住这个大好时机，改善管理，增强协作，这样才能保证子孙后代享受锡林郭勒草原的繁荣与昌盛。

第 8 章

通过锡林郭勒生物圈保护区实现保护与发展的结合*

本文基于对中国内蒙古草原的调查结果，调查区属于锡林郭勒生物圈保护区。该保护区成立之初的目的是保护这一地区的生物多样性和促进当地社区生态、经济和文化的可持续的经济发展。目前保护区的草场由几个国营和集体牧场分别进行管理，他们可以自行制定草地利用规划，发展畜牧业，向市场供应家畜乳肉产品。在提高当地群众经济收入的同时，完成中央下达的经济任务和其他优先完成的战略目标。尽管国家自然保护法规赋予保护区一定的法律权力，但实际上，在与草地和资源使用有关的活动中，锡林郭勒生物圈保护区处于无权状态。

目前，牧民所采取的放牧方式也是非持续发展方式的。整个草原上的草场仍在不断退化，尤其以嘎查(村庄)周围和水源点附近这些放牧频率较高的地区退化最为严重。草地退化造成草场生产力下降，已经严重威胁未来畜牧业的发展。而对退化草地生产力的恢复将是一个漫长的过程，并且需要较大资金投入。尽管所有的牧民和草场管理者已经认识到退化问题的严重性，然而在现实的牧场管理中他们主要关心的目标，仍是以增加家畜头数从而提高畜产品产量的做法来完成中央确立的五年计划的经济目标。

8.1 统一牧场与保护区的目标

如果那些已划定的地区仍作为生物圈保护区进行管理，那么我们必须合理协调牧场和保护区之间由于目标不一致所引起的矛盾。同时制定一系列新的保护区管理和草地利用条例，这些条例要为保护区内的牧场场主所接受，实现生物多样性保护和草地可持续利用管理结合的目标。

在中国，机构臃肿的各个部门之间的交流似乎非常少。在北京尽管有关部门已经制定了有关环境管理办法的条文，如《中国生物多样性行动计划》和《中国 21 世纪议程》。并

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* Rik Thwaites 于 1996 年在锡林郭勒草原所进行的研究

且,把生物多样性保护和为大多数农牧民解决温饱问题相结合的理想方法——生物圈保护区的概念在中国也逐步被采用。然而在制定经济发展战略时,部分政府部门仍然一味追求经济效益,而不考虑环境的生态容量。事实上在进行大尺度的景观规划时,需要采用综合的管理办法,把人类发展、生物和文化多样性保护等多种目标考虑在内。

8.2　完善的分区制度和明确的管理条例

锡林郭勒生物圈保护区在管理过程中要实现诸多管理目标相结合的任务,这些目标是互相联系的。因此盟政府在其中将起着十分重要的作用。白音锡勒牧场由锡林郭勒农牧局管理,锡林郭勒生物圈保护区属于锡林郭勒盟城建局和环保局的下属单位。锡林郭勒盟政府必须保证下属各有关单位在工作中不产生矛盾,这样才能完成上面所提到的那些综合目标,同时也才能实现生物圈保护区管理的多项目标。在锡林郭勒生物圈保护区的管理过程中,其他各级政府也要作出努力,逐步认识建立保护区的重要性并参与制定保护区的整体目标、筹备资金和提供其他资助。

目前,生物圈保护区的管理非常混乱,没有成文的管理规划、远景规划管理条例、明确的管理目标和实现保护区管理目标的行动计划。当前保护区的功能区划分也不适当,不能体现生物圈保护区多目标的特点。任何管理计划都应该建立在合理的分区制度之上,这将有助于完成生物圈保护区的所有目标。另外为了实施生物圈保护区政策和国家环境保护总局制定的自然保护法规,需要建立完善的分区制度。由于保护区的分区要包括白音锡勒牧场和其他几个牧场,因此这些牧场和锡林郭勒盟政府都要参与制定保护区的管理规划。白音锡勒牧场是建立不同类型核心区的重要地区,如严格禁牧区。所以白音锡勒牧场在建立保护区管理规划中起着举足轻重的作用。然而,为了顺利地完成这一管理规划,白音锡勒牧场必须把牧场的管理目标和生物圈保护区的目标结合起来。

8.3　鼓励当地牧民参与草场管理

锡林郭勒生物圈保护区、白音锡勒牧场、锡林郭勒盟和其他机关单位要一起制定生物圈保护区管理规划,明确景观管理目标和划定各个功能区,来完成保护区的各项目标。保护区内的功能区划应当是实现管理目标的一种灵活手段,而不是管理的结果或管理目标本身。草地开发利用制度是确保管理好草场资源的关键因素。资源使用者对资源的支配权的大小对保证资源的可持续利用也起着非常重要的作用。在白音锡勒牧场,牧民拥有家畜并有权管理他们自己的家畜,而牧场仍然保留有管理草地的权力。这种由于资源使用权和资源管理权的分开,导致大家都不去考虑草场未来的状况如何,这也是造成草场退化的主要原因之一。目前的草场状况已经提示我们应该将草场的管理权分配到个人,也就是说要给每一个牧户划定草场,像在家庭联产承包责任制(House-hold Prodution Responsibility System)指导下在其他草原上进行的管理模式。牧民们为了管理好自己的草场,防止其他牧户的牲畜进入,要建立围栏。在有些情况下,这种办法已经改善了草场状况;但在另一些地方,草场仍在退化。除了建设和维护费用问题之外,围栏也引起了其

他问题，如围栏成为野生动物移动的障碍，改变了自然的开放草场状态，以及草原的生态和文化特征。

通过划定草场给牧民，牧民们就有权根据实际情况进行草场管理，可以根据草场的可利用程度，确定载畜量。目前在管理较好的牧场中，牧民们也可能会考虑保持草场的生产力——可持续的产量。为了达到可持续的产量，并且在努力完成包括生物多样性保护的生物圈保护区整体目标的过程中，牧民会采取不同的管理办法，这种做法也可能会造成草场发展状况各异。生物圈保护区的环境保护是一个社会目标，对于这些目标不能期望仅仅由牧民单独来完成。保持草场公有制的目的之一就是应用综合管理办法来实现这一社会目标。生物圈保护区保护景观多样性、生态系统多样性和遗传多样性，这实际就是一个社会目标。因此在锡林郭勒生物圈保护区，对属于公有制的草场仍然保持其公有制形式或集体所有制的形式是非常必要的。把更多的草地分配给牧民可能造成牧民对草场的利用由保护与发展相结合转向产量目标，并放弃对生物圈保护区多样化目标的实现。这将抹灭生物圈保护区存在的意义。

8.3.1 保证利益相关者参与草场管理

白音锡勒牧场不应当把草场简单地分配给牧民，而是需要建立一套完善的管理机制以激励牧民管理好草场，草场的所有权仍属于集体，保留其“开放”或“半围封”状态。

白音锡勒牧场管理中的另一个问题是牧民没有机会参与牧场的管理。尽管在有些情况下，牧民非常愿意经营好草场，而在草场管理中却没有他们的份。由于白音锡勒牧场的领导不愿意或没有气度听取和采纳牧民们的建议，因此在管理中，牧民有时表现得非常沮丧。在管理决策过程中，牧民很少有机会表达自己的思想或参与到实际的管理中。因为在保护区的管理中股东的参与，是可持续发展理论和生物圈保护区策略的一个主要组成部分。这种参与方式有诸多好处，包括对草场的管理权明确，并由指定人员解决具体问题。

8.3.2 保证牧民参与牧场领导的选举

白音锡勒牧场的管理制度要保证牧民长期参与和在管理决策及制定规章制度过程中的真正职责。在白音锡勒牧场，为了更好的管理，把整个牧场分成许多分场。在改革开放之前，每个分场负责管理自己的草场和家畜。而从经济改革以来，家畜由每个牧户管理，而草场由分场管理。分场是国营牧场最基本的管理机构。在这一级，尽管形式上牧民有参与管理的可能，但实际上，他们没有参与管理的真正机会。而且分场也不会给牧民真正的参与机会。国营牧场采取的是自上而下强制式的管理模式，由他们自行制定管理条例和执行管理。在集体牧场，至少可以通过民主选举选出场长和其他领导。而在白音锡勒牧场，所有的领导职位都是由上级任命的，牧场场长由锡林郭勒盟农牧局任命，然后牧场的其他领导包括分场场长是由总场场长来任命。

作为牧场的自然功能分区和进行行政分管的分场制度已经存在。目前管理中出现的问题之一是资源管理(分场)和资源利用(牧民)职责的分离。在中国已被广泛接受的管理办法是把草场承包到户,也就是让资源使用者来管理资源。像上面所说的,这种制度将导致人们忽视草场使用中的社会目标,而只集中于个人畜产品数量的增加(个体牧户畜产品产量深受国家有关提高生产力、增加收入政策的影响)。解决这一问题的办法之一是把对家畜的管理权归属于分牧场,但前提是牧场的场长有能力并愿意既考虑草场的生产力问题,同时也注意环境问题,但是这样又回到改革前的中央集权管理体制。我相信,这个办法在政治上是行不通的。另一个办法是由一个集体或几个集体合作管理和使用资源。

8.3.3 提高牧民对草场可持续利用和管理的责任心

合作管理模式能使资源使用权和管理权相结合,同时为当地社区牧民真正参与管理提供机会。任何这样的合作管理模式需要由本地区的有关集体和群众来制定,而不是由外来的研究人员强加于他们。尽管合作管理模式在全世界其他地区的资源使用中已经建立,但在中国,我想这一模式对当前领导者的思想将是一个大的挑战,仍需要进行试点实验。

在确保所有牧民是合作经营中的合伙人的基础上,要加强牧民对草场可持续的利用和管理的责任心,同时在管理中应首先考虑必要的环境条件和环境条件对管理活动的制约。合作管理中的其他合伙人包括白音锡勒牧场管理局和锡林郭勒生物圈保护区。

在牧场经济改革之初,在每个分场召开会议,让牧民们参与讨论在当地如何执行经济改革政策,这种会议给牧民提供了发表自己观点的机会。如果将来牧民要参与到合作管理中,类似这样的会议在每个分牧场还需要举行,当然也需要有一些制约机制和保护牧民权利的措施,牧民们要参与制定这些措施。那么在合作管理中谁将有权力成为合伙人呢?如何控制外来人员或机构参与放牧?如何确定每个牧场的放牧强度?如何把随机放牧制度和合作管理模式合并起来?在建立这种资源利用的模式时,必须考虑生物圈保护区的保护目标和管理目标相结合。

通过市场的经济杠杆作用来控制牲畜头数的机制之一是放牧权的交易。在每一个分场中,从草场的可持续利用角度考虑,确立许多放牧单元。把这些放牧权公平地分给当地的牧民(而不仅仅是牧场的职工),这样牧民就有权出售他们的放牧权,或离开草场进行其他投资活动,或通过买进其他人的放牧权来增强自己的实力。但这一制度也存在许多问题,例如,有的穷牧户没有能力购买放牧权,有的牧户无力引进牲畜新品种,或者是有势力的人强迫牧民出售他们的放牧权。如果这些问题能得以妥善解决,那么放牧权交易就是控制牲畜数量较好的办法,而牲畜头数是保证草场可持续利用的关键。

8.3.4 保护区要为当地牧民开拓畜产品销售渠道

白音锡勒牧场应该放弃坚持其头数牲畜业的牧业经营策略。家畜头数可通过在分场

内分配可交易的放牧权进行控制。在考虑到随机放牧和责任制放牧制度下，每个放牧单元的家畜绝对头数随草场的自然状况和当地的经济状况而定。对牲畜数量增减幅度大小和时间的选择由合伙人来决定。交易的市场价格要依草场状况而定，因而此时维持草场状况良好成为牧民最关心的事情。

目前家畜及其产品的销售制度很不完善。在白音锡勒牧场，牧民主要依靠那些街头小贩来出售牲畜。而在市场需求低的情况下，小贩们就不去购买牲畜。由于市场上也没有形成一种有效的激励高质量畜产品的机制来鼓励牧民提高产品质量，牧民误认为头数畜牧业是草场管理中的重点。如果允许所有牧户都参与到市场竞争中，并建立价格体系，这样就可以鼓励他们不断提高畜产品质量，又能激励牧民维持和改善他们的草场状况。那么在白音锡勒牧场，我们有可能建立公平的家畜销售制度。当草场生产力下降、市场需求低时，白音锡勒牧场要帮助牧民进行畜肉加工和贮藏处理来减少牲畜数量。

8.3.5 白音锡勒牧场在发挥生物圈保护区特点中的作用

白音锡勒牧场已经认识到不能仅靠扩大畜牧业来满足社会福利和当地社区的经济收入，建议要扩大食品加工业、机械制造业和旅游业。由于这些新兴产业的扩大和发展和收入的增加，给牧场传统的头数畜牧业带来冲击，使牧场减少了通过牲畜量来增加收入的愿望，但要使整个草原摆脱牲畜超载的状况，必须让牧民受益于这些新产业。也就是说，如果从旅游业中所获得的利润全部装入旅游经营者个人的腰包或归牧场所有的话，那么在白音锡勒牧场不适合进行生态旅游。因此在开展生态旅游的活动中，牧场要为当地牧民创造真正参与旅游经营和管理的机会，并使他们从中获得收益。

从目前来看，白音锡勒牧场并没有行使其作为保护区的功能，也没能实现生物圈保护区的诸多目标。虽然白音锡勒牧场已实施了一系列开发项目，但忽视了规划对草场管理、景观多样性、生态系统多样性、物种多样性、遗传多样性及当地人们文化生活的影响，而只是名誉上、表面上的保护。在中国要实现生物圈保护区的多种目标，各级政府必须做大量的必要的基础工作，同时这些目标的价值要得到国家的认可。

这也为建立生物圈保护区，或者说在发展中国家建立生物圈保护区提出了问题。锡林郭勒已被列为生物圈保护区，属于联合国教科文组织的世界生物圈保护区网络成员，在国际上被认为是保护中国典型草原生态系统的关键区域。另外中国建立了国内的保护区网络(CBRN)并得到国际上的认可，中国政府对生物圈保护区的态度也是很严肃的，这将有利于保护政策的实施。然而，这些生物圈保护区在实际操作中很少能发挥应有的作用，国际和国内的保护区政策在实际应用中时不能很好地执行。

在景观尺度上实现保护与发展相结合的目标方面，生物圈保护区是否是一种有效的模式？许多国家似乎支持了这一模式，并在他们的国家建立了生物圈保护区。当保护区的政策在实践中执行的时候，我们需要作大量的监测工作，以保证保护的有效性和实现生物圈保护区的诸多预期目标。

8.4　结论

现在需要对国际生物圈保护区项目的执行进行再认识。从锡林郭勒生物圈保护区所收集的资料来看，国际组织与 UNESCO（联合国教科文组织）和世界保护监测中心（WCMC1994）所拥有的信息不能真实地反映当地的实际情况。锡林郭勒生物圈保护区在执行保护政策时，与其他保护区一样，遇到了同样的难题，那就是处理在保护区建立之前就已经存在的经济、政治、社会和文化问题。如果数据库的信息已经过时、内容有误或掩盖了真实情况时，这种数据库存在意义又何在呢？对每一个保护区在执行保护策略时所遇到的政治上和法律上的问题需要做更进一步的研究。只要国家（如中国）对其土地有主导权时，他们就非常积极地采纳生物圈保护区的思想，并把她作为与当地社区结合为一个整体的概念来应用。但在生物圈保护区管理过程中，UNESCO 和其他国际组织要给予生物圈保护区更多的帮助，尤其是在发展中国家。

我们需要找到有创意的、合理的解决办法以鼓励和帮助保护区政策的制定和实施，并保证能完成保护区的所有目标。在新建立的保护区判断有关政策的执行是否正确以及解决问题的途径是否妥当，需要采用协同管理的办法。对申请国际生物圈保护区的新成员，应充分考虑提名表翻译的确切性以及考核该保护区能否同时满足当地发展的目标和国际组织（联合国教科文组织）目标。并且从提交提名表到接纳为新成员之前，对其评审应当是一段时间过程，在此期间被提名的保护区应在一定程度上达到生物圈保护圈所要求的条件。通过 UNESCO 提供国际水平的技术培训和经验交流，提高保护区的管理能力和员工的认识水平，从而使保护区的功能得以实现，在建立生物圈保护区时，应首先明确要达到的目标和制定管理计划。对于管理者来说，应该及时检查保护区所取得的进步，以便顺利地完成保护区预期的目标。这就需要引入一种独立的评价成果体系。截止 1996 年，已经建立了 329 个生物圈保护区，分布在全世界 83 个国家，总面积达 2.18×10^8 km^2（UNESCO 1996b）。但又有多少个保护区已经达到了他们的目标或开始实现他们的初步目标了呢？

在本研究中所要解决的可持续放牧制度需要考虑草场管理和草场退化问题。本研究的主要结果是有关财产所属权和利益相关者参与的问题。有人提出如果不能保证牧民的资源使用权力和在管理中的地位，放牧制度仍将沿着不可持续的过程进行，造成草场状况恶化和牧场的发展受到限制。同时我们也知道只有草场管理者、牧场和牧民都接受了保护区的综合目标，生物圈保护区才能发挥其功能。本研究的另一个主题就是民族问题。目前的办法很难处理现在的民族问题，况且也没有充分的证据表明不同的民族在草场使用中或对草场的态度有什么差异。现在草原上主要以汉族人口占大多数。尽管许多蒙古的草原文化已经消失，但由于存在着民族差异，许多办法都不能彻底解决草地管理中所遇到的问题。因此我们允许牧民离开草场，使留下来的牧民就有更多的选择来实现可持续的放牧制度。

本文决不是要回答在锡林郭勒自然保护区或其他地区的与生物圈保护区政策有关的

所有问题。只是为了更好地理解草场正发生着的变化及它们对生态、社会和政治的影响，同时帮助草场管理者达到可持续的草场利用目标，那么在锡林郭勒生物圈保护区我们仍然需要做大量的研究工作。全世界的许多国家已经采纳了生物圈保护区的思想，这表明这些国家已经认识到生物圈保护区是达到他们的景观可持续管理目标的适用的模式（尽管研究发现采纳这一模式可能是其他原因）。在理论上，通过建立可持续的景观管理制度，生物圈保护区思想能加强保护与发展的结合。然而，在锡林郭勒的研究表明，现实与我们所要达到的目标差距非常之大。因此管理模式本身不能保证国际政策目标的实现。要想取得进步，只有当地牧民对这些目标充分进行理解，并坚定地保证实现这些目标才是关键。

附录 1

锡林郭勒生物圈保护区的建立背景

1.1 保护区背景介绍

锡林郭勒草原自然保护区成立于 1985 年，是我国第一个自治区级（省级）草地类自然保护区，1987 年被联合国教科文组织人与生物圈计划国际协调理事会接纳为国际人与生物圈保护区网络成员（到目前为止我国加入该国际组织的保护区只有 21 个）。1993 年首批加入中国人与生物圈保护区网络，1995 年与澳大利亚普克马克生物圈保护区结为姊妹友好保护区，成为我国第一个与国外相关保护区建立友好关系并长期保持交流合作的保护区，1997 年底被国务院批准晋升成为国家级自然保护区。

锡林郭勒自然保护区位于蒙古高原的东南部，内蒙古自治区锡林郭勒盟锡林浩特市境内。其空间范围以锡林河流域自然分水岭为界，地理坐标为北纬 43°26′～44°34′，东经 115°30′～117°12′，面积 10 786 km^2。全区海拔介于 950 m～1 500 m，由东南向西北倾斜。保护区的气候具温带、半干旱大陆性的特点，四季分明。年降水量 300 mm～400 mm，波动幅度很大，丰水年可达 500 mm，干旱年仅 166 mm，70 %降水集中于 7 月～9 月。年蒸发量 1 600 mm～1 800 mm，为降水量的 4 倍～5 倍。保护区内的地带性土壤为黑钙土和暗栗钙土。已知保护区内共有种子植物 658 种，分属于 299 属，74 科；苔藓 74 种，分属 47 属，22 科；菌类 46 种，分属 13 科；地衣 29 种，分属 20 属，11 科；蕨类、藻类尚未进行深入的研究。保护区境内的野生动物区系反映了蒙古高原草原生物群落的一般特征，同时，也保持着一定的区域特殊性。据调查，本区有兽类计 33 种，隶属 6 目 15 科。锡林郭勒草原计有鸟类 129 种，隶属 13 目 33 科，分布在保护区境内的鸟类计 76 种，占 54. 7 %。

锡林郭勒自然保护区选择草甸草原、典型草原、沙地疏林草原、河谷湿地等生态系统和景观为重点保护对象：第一，草甸草原，植被构成以贝加尔针茅、羊茅、线叶菊为优势种。第二，典型草原以大针茅、克氏针茅和羊草为建群种。第三，沙地疏林草原：在沙地生境上发育着沙地云杉林群落片断，山杨、白桦林斑块、榆树疏林、多种灌丛和沙生植物群落。第四，河谷湿地集中分布在锡林河河源和中、下游地带，中、上游以禾草、杂类草草甸、沼泽和

柳灌丛为主、下游则以高大禾草盐化草甸和盐生灌丛的结合为特征。

锡林郭勒保护区是由原国家城乡建设环境保护部和农牧渔业部共同投资建立的，并作为全国草地类自然保护区试点，得到了自治区人民政府和锡盟行署及锡林浩特市人民政府的大力支持，聘请国内有名望的草原专家数十位编制了规划大纲和项目建议书，1985年经自治区人民政府批准后保护区进入建设实施阶段。国家环保局第一任局长曲格平教授为此欣然题词祝贺：草原自然保护区的建设开创了我国草原保护与建设的新纪元。当时的布赫主席专为保护区题写了保护区名，随着时间的推移，农牧渔业部从主管部门退了出来，在建设部和环保局分家后，锡林郭勒草原自然保护区最终成为环保部门一家主管的保护区。

锡林郭勒草原自然保护区全境属锡林浩特市管辖，共包括白音锡勒牧场(全境)、毛登牧场(全境)、贝力克牧场(全境)、白音库伦牧场(北半部)、伊利勒特苏木(全境)、巴彦宝力格苏木(全境)和锡林浩特市(镇)等单位。锡林浩特市大致位于保护区的中心位置，白音锡勒牧场是保护区的主体区域，保护区的绝大多数功能区都位于白音锡勒牧场境内，保护区现有5处核心区，2处生产试验区，1处科研监测和旅游服务区，1处示范牧场，面积30 km^2，约占保护区总面积的0.3%。

1.2 保护区的功能区域

保护区从1985年成立就依自治区政府批复划定海流特典型草原核心区、查干敖包草甸草原核心区、灰腾锡勒草甸草原核心区、陶乌音陶勒盖残遗白扦云杉林核心区和阿布都尔图山杨、白桦林核心区等5处核心区和东台子退化草场改良恢复试验区、黄花沟打草场实验心区等两处生产实验区，后又发展了实验示范牧场及科研监测和生态旅游服务中心两个功能区。前4个核心区(除灰腾锡勒草甸草原核心区)和2个试验区在保护区1985年建立后不久就由国家投资全部进行了网围栏保护，但由于没有专职的管理机构，加之工作力度不够，很快就全部遭到了毁灭性的破坏。1993年成立了保护区管理处，多方筹集资金对云杉林核心区、山杨白桦林核心区、海流特典型草原核心区和东台子退化草场改良恢复试验区等5个区域进行了重建，并雇专人看护，剩余查干敖包草甸草原核心区和黄花沟打草场试验区彻底破坏再无力维修至今。重新修建的5个区域也是不断遭到破坏又不断进行维修，并且保护区上一届领导与白音锡勒牧场签订了黄花沟打草场试验区30多年的草场使用合同，无偿给白音锡勒牧场中外合资马场使用。东台子退化草场改良恢复试验区于1997年、1998年均遭到严重破坏，并连续2年被强行进入打草，到1999年已面目全非，至今无力修复。目前保存完好的只有杨桦林核心区、云杉林核心区和海流特典型草原核心区，另外，生态旅游服务中心(扎格斯太度假村)经过努力也保存了下来。1999年新的领导班子上任后，在上级部门的重视关心下，经过努力得到了除实验示范牧场以外的其他7个功能区域的土地使用权，并维修了3个核心区，在自然保护工作中迈出了扎实的一步，使得保护区的保护管理有了可靠保证。

1.3 保护区的科研监测工作

锡林郭勒草原自然保护区成立后，立即引起国内外众多专家、学者和科研机构的重视。中科院的许多专家都到此进行过考察研究，特别是中科院定位站、内蒙古大学自然资源研究所等单位更是做了大量工作，并有日本、俄罗斯、蒙古、美国、澳大利亚的许多专家到此进行过合作研究，取得了大量的科研成果，为保护区的科学化管理打下了基础。进入20世纪90年代，锡盟生态监测站成立，担负起了保护区的植被年动态监测工作，保护区几经变化，但这样的科研监测一直保持至今，实为难能可贵，为保护区的进一步发展积累了宝贵资料。

1.4 国际交流合作

通过中科院定位研究站，锡林郭勒保护区于1994年与澳大利亚查理·斯德特大学开始有了接触，并合作进行自然保护区方面的科学研究工作。1995年，以这样的合作研究为基础，经多方努力，锡林郭勒保护区与澳大利亚普克马克生物圈保护区结为姊妹友好关系，友好关系声明称：此关系的建立旨在共同发展生态上可持续的半干旱环境利用，友好关系将随着资讯和人员的交流而不断得到加强。以后的各项实践活动印证了这一声明，其中1996年、1999年普克马克保护区分别为锡林郭勒保护区培训了3名科研人员，时间分别为2个月、3个月。在1996年—1999年4年中，锡盟的3位盟领导和自治区环保局领导代表锡林郭勒保护区到澳大利亚普克马克保护区及其毗邻地区进行了访问考察，澳大利亚也3次派当地政府官员和保护区领导及业务人员到锡林郭勒保护区进行访问考察和合作。2000年的8月1日—15日，普克马克的监测专家又到锡林郭勒保护区进行了为期15天的业务工作。通过互访交流加强了彼此的友好合作关系，加深了友谊，并且更为重要的是通过交流加深了中澳两地区间的交流合作，为锡盟的招商引资创造了条件。这样的跨国保护区长期交流合作在中国是惟一的1个，在国内外得到专家学者的肯定和支持。

1.5 保护区机构、人员编制及经济状况

保护区成立后得到盟行署的大力支持，特别是1999年加强了对保护区的管理，盟编办下文撤销了原保护区管理处，成立了保护区管理局，为准处级事业单位，财政全额拨款，改变了过去自收自支的企业性质，管理局下设行政管理科和资源管理科，从盟环保站带编调入4人。保留治安派出所，人员按过去批复方案不变，财政不拨款，实行自收自支。2000年从盟接待处调入保护区1名专职副局长，这样，保护区现只有正式编制人员5人。锡林郭勒保护区面积在全国排第2位，但正式工作人员只有5人，其中有高级职称1人、中级职称2人、初级职称1人，这与保护区的名声、地位等都极不相称，严重影响了保护区正常工作的开展。特别是保护区派出所，在自治区公安厅、锡盟行署等部门的支持关心

下，于 1998 年就得到内蒙古自治区公安厅、盟行署的批复，但 4 名人员一直落实不了。治安派出所是代表保护区行使执法权力的机构，对于维护保护区内的治安状况，打击偷猎、乱采、滥挖、乱垦等非法活动，保护保护区内野生动植物等起着至关重要的作用。治安派出所也是根据《中华人民共和国自然保护区条例》的有关条款配备的，但恰恰是这样一支队伍建立不起来，严重影响了保护区的日常管护工作。目前，保护区内偷猎、乱挖药材和擅自开荒等非法活动十分猖獗，但保护区派出所配备的 4 名工作人员连基本的工资都保证不了，更别说去执法办案了。这对保护区造成了不可估量的破坏和损失。另外，这么大面积的保护区，目前只有 5 名正式编制人员，每天日常事务性工作已应接不暇，很难保证保护区其他工作的开展。像这么大面积的保护区就是在发达国家也最少配备十几到二十多位国家公务人员来进行管护管理，而在我们国家保护区本身基础设施就十分落后，这就需要投入更多的人力、物力才能达到保护管理的目的。而恰恰相反，我们国家很难做到这一点，绝大多数保护区因无人力、财力来源处于瘫痪或半瘫痪状态。自然保护事业是造福当代、惠及子孙后代的公益性事业，而没有必要的人力财力支持根本实现不了这样的目标。锡林郭勒保护区是目前自治区惟一的 1 个加入联合国教科文组织人与生物圈计划的保护区，在国内外享有很高的知名度，在国际生物圈保护区中占有重要的位置，并且还是惟一与国外相关保护区保持长期友好合作关系的保护区，得到国内外众多知名专家的肯定和支持。但近年来由于必要的人员配置、基础设施等没有跟上，保护区出现的问题越来越多，我们急切呼吁有关领导和上级部门对此高度重视，加强对锡林郭勒保护区的领导，保护好锡林郭勒大草原，保护好我国北方最大的天然生态屏障。

目前保护区负债总额 1 444 774.6 元，这还不包括从 1999 年以来还掉的 247 042.33 元，而且这部分还款绝大部分是以牧场牲畜抵资还的。现在保护区还有实行自收自支的工作人员 14 人，只能按 70% 发放工资，并且从今年 1 月份到现在就连这 70% 的工资还没有发放。所以，目前保护区的经济状况十分恶劣，使人有种喘不过气的感觉。

1.6　保护区的经济实体

1.6.1　大自然接待处

大自然接待处在 1997 年后，出现的问题越来越多，加之经营管理不善，在 1999 年的审计报告中，已积累亏损近 100 万元，已经资不抵债，濒于破产。保护区新的领导班子上任后，迫于无奈，经过一段时间的摸索，在咨询了盟体改委、仲裁办、就业局、社保局等部门后，在充分讨论的基础上，最后经职工大会通过，接待处实行转制经营，部分职工下岗，再进行承包经营。通过这样的转制，扭转了继续亏损的局面，保护区也扭转了过去以经营为主的局面，转到保护管理的主业上来，通过近 2 年的运行，现在看来这样的路子是走对了。但这么多年的积淀，保护区付出的代价也实在太大了，就是多年来对自然保护与管理主业的忽视。

1.6.2 实验示范牧场

实验示范牧场从 1997 年开始，由于多方面的原因，逐渐走向低谷，特别是由于草场问题，与周边牧民不断产生摩擦，牲畜头数不得不逐渐减少。在 1998 年、1999 两年中，由于与赤峰克旗边界问题，克旗牧民组织数十人，两次闯入示范牧场，进行了毁灭性的打砸，造成直接经济损失近 50 万元，保护区管理处多次向民政、监察、公安、环保等上级部门反映，最后都是石沉大海，没有回音。经过这样的灾变，示范牧场的生产已近乎瘫痪，牲畜总头数已不到千头（只），职工也锐减，草场更是越来越少，到 2000 年 6 月初，示范牧场已从白音锡勒牧场争取不到草场，只好撤走。目前只有 1 名职工，100 只羊，以留守看护房屋等财产设施。

1.6.3 科研监测与生态旅游服务中心（扎格斯太旅游度假村）

科研监测与生态旅游服务中心（扎格斯太旅游度假村）正式兴建于 1993 年，开始只有几顶蒙古包，接待规模和档次都很低，1995 年，由锡盟计委立项并投资 15 万元兴建了保护区展览室，把位于锡林浩特市大自然接待处的展览室全部搬迁到到该中心，从此该中心的接待规模、档次和内容上升了一个台阶，由单纯的接待变为了多功能的服务区，逐渐发展成为集旅游、服务、科研监测、宣传教育和示范等为一体的多功能基地，成为保护区一个极为重要的功能区。经过逐年投资，不断更新设施设备，同时增加新内容，使得接待规模、水平档次不断提高。1999 年，为圆满完成全区农村牧区精神文明现场经验交流会接待任务，欠资兴建了 1 幢展览馆和工作人员科研监测用房，面积 600 多 m^2，造价 50 万元，资金至今仍无着落。目前，该中心基础设施基本齐备，宣教设施和内容也较完备，发挥着保护区和锡林郭勒盟的一个对外宣传的重要窗口作用，已是锡盟环境教育和爱国主义教育基地，这是惟一的一个从建立到现在一直发挥保护区主体功能作用的区域，希望引起上级部门的高度重视，加强资金投入，使其持续发挥保护区功能作用。

1.6.4 实验农林基地（造林基地）

实验农林基地位于锡林浩特市西北锡赛公路 5 公里路南，过去是建设系统的城防林基地，保护区 1991 年接管该基地，主要任务仍是城防林建设，经济效益谈不上，但产生了良好的生态效益和社会效益。多年来，保护区投入的多，产出的少，但总体上不影响保护区的建设发展。

1.7 采取有效措施加强管理保护

为切实加强保护区的有效管理，我们将采取以下措施：

（1）将派出所的工作人员全部投入到保护管理中来，加强巡护，加大执法力度，处理

一些典型案例，扩大保护区的知名度，提高保护区的管理水平。

(2) 利用一切机会，采取形式多样的手段，加强宣传教育，提高人们的环境意识，争取人们自愿参与到自然保护中来。

(3) 在进入旅游区进行收费的同时，强化入区的宣传教育，以达到管理保护的目的。

(4) 在保护区白音锡勒核心区域建立管理站。

(5) 与旅游局、白音锡勒牧场共同制订旅游区内的旅游规划，便于统一利用自然资源，使我盟旅游业得到可持续发展。

(6) 积极配合有关部门，力争今年使《锡林郭勒国家级草原自然保护区管理条例实施细则》经自治区人大常委会立案通过，使我们的执法有法可依、有章可循。

(7) 逐步扩大核心区的面积，以达到国家要求的核心区面积占保护区总面积的10%。

(8) 力争一批好的项目，加强保护区的科研监测工作，提高保护区的科学化管理水平。

(9) 充分利用中加合作项目，加强与社区居民的联系，力争使保护区各方面的工作提高档次和水平。

1.8 保护区的工作需要关心和支持

保护区的工作是功在当代、利在千秋的社会公益性事业，它需要全社会的关心、理解和支持，更需要上级部门的大力支持，我们觉得以下几项工作需要得到盟行署理解和支持才能得到解决，否则只靠保护区自身的努力是无法完成的。

(1) 工作正常运转所需经费，包括以下几部分。

① 办公经费 5 万元；

② 核心区维修费 11 万元(其中 5 个重建，每个需 2 万元；两个维修需 1 万元)；

③ 正常巡护费 5 万元(包括看护人员工资；车辆维修及汽油费；巡护人员补助等)；

④ 放火设施费 1 万元。

以上共计 22 万元。

(2) 派出所人员编制。

(3) 保护区内旅游景点的统一管理。目前保护区内的旅游景点很多但缺乏统一监督管理，对生态环境造成严重破坏。因此，我们建议凡是在保护区内开展旅游活动的，必须要经过保护区管理局的同意后，才能办理其他手续。

(4) 由盟行署牵头，定期召开包括农管局、白音锡勒牧场、锡林浩特市政府等部门参加的联席会议。由保护区管理局做工作汇报，征求多方面的意见，把保护区的工作做好。

附录 2

锡林郭勒国家级草原自然保护区大事记

1. 1984 年 11 月 2 日，内蒙古自治区人民政府下文，决定成立自治区草原自然保护区调查规划领导小组，要求规划小组在 1985 年底前完成草原自然保护区的调查规划工作，并在锡盟白音锡勒牧场地区建立一个草原自然保护区，作为全国草地类自然保护区的试点。

2. 1984 年 12 月 25 日，自治区建设厅副厅长、规划小组组长廉皓与锡盟盟长乃登、副盟长张应琦就锡林郭勒草原自然保护区的建立在锡盟建设处会议室专门召开协商会议，参加会议的有盟计划处、农管局、建设处、草原工作站、市政府、市建设局、白音锡勒牧场的领导及工程技术人员和自治区自然保护区调查规划领导小组顾问及工作人员共计 15 人。会议议定了保护区的范围、名称、任务和管理机构等。

3. 1985 年 1 月 14 日，内蒙古自治区锡林郭勒草原自然保护区项目建议书完成。

4. 1985 年 4 月 9 日至 10 日，自治区建设厅在呼和浩特市组织召开了“锡林郭勒草原自然保护区规划设计方案论证会”。

5. 1985 年 4 月 17 日，自治区建设厅正式向自治区人民政府行文“关于建立《内蒙古锡林郭勒草原自然保护区》的报告。

6. 1985 年 5 月 18 日，自治区人民政府下文批复同意建立内蒙古锡林郭勒草原自然保护区(自治区级)。

7. 1985 年 8 月 5 日，在锡盟白音锡勒牧场隆重召开内蒙古锡林郭勒草原自然保护区成立庆祝大会。

8. 1985 年 8 月，自治区人民政府主席布赫为保护区题写区名。

9. 1985 年 8 月，为祝贺内蒙古锡林郭勒草原自然保护区的建立，国家环保局曲格平局长题词“草原自然保护区的建立，开创了我国草原保护与建设的新纪元”。

10. 1986 年 12 月，保护区下属经济实体——大自然接待处建成并投入使用。

11. 1987 年 6 月，联合国教科文组织驻北京代表泰勒博士到保护区考察。

12. 1987 年 7 月底至 8 月上旬，中日多学科专家联合在保护区进行了植被、土壤等学

科的考察研究工作。

13. 1987 年 9 月 7 日，保护区被联合国教科文组织正式接纳为国际 MAB 成员。

14. 1988 年 12 月，保护区实验示范牧场组建成立。

15. 1991 年，保护区接管盟城建系统的造林基地，并将之转变为保护区的一个经济实体——保护区造林基地。

16. 1992 年，保护区开始了各功能区内外的植被对比监测工作。

17. 1992 年 6 月 23 日，盟机构编制委员会下文批复，大自然接待处由集体企业转为自收自支事业单位，实行企业化管理。

18. 1993 年 3 月 3 日，盟委组织部下文任命阎永旺同志为保护区专职副处级干部。

19. 1993 年 7 月 12 日，保护区首批加入中国 MAB 网络。

20. 1993 年 7 月，保护区在白音锡勒牧场扎格斯太湖东畔创办旅游度假村。

21. 1993 年 7 月 31 日，中国 MAB 国家委员会主席孙鸿烈到保护区访问考察。

22. 1993 年 9 月，澳大利亚查理-斯德特大学约翰-斯通公园恢复与遗产中心主任 Terry De Lacy 教授到保护区考察，并决定今后 2 年～3 年内在保护区进行“保护与发展”、“保护区与居民关系”的研究。

23. 1994 年 3 月 21 日，盟机构编制委员会下文批复成立保护区专职管理机构——保护区管理处，管理处为准处级事业单位，编制 8 人，经费实行差额补贴，盟财政每年列支 1.5 万元定额补贴。

24. 1994 年 7 月 25 日至 31 日，全国草地类自然保护区管理培训班在保护区举行，会议期间，与会的有关专家对保护区进行了评估。

25. 1994 年 7 月 31 日，保护区成立了科技协调组，由保护区管理处、内蒙古大学和中科院内蒙古草原生态系统定位研究站共同组成，保护区聘请两单位为科研依托单位。

26. 1995 年 4 月，保护区管理处阎永旺处长应邀到澳大利亚进行了为期 15 天有关自然保护区方面的访问考察。

27. 1995 年 5 月 18 日，保护区又一经济实体——大自然茶苑开业。

28. 1995 年 8 月 5 日，保护区成立 10 周年庆祝大会暨学术研讨会在扎格斯太旅游度假村隆重召开，国家环保局金鉴明局长应邀出席。

29. 1995 年 9 月 25 日，保护区与澳大利亚普克马克生物圈保护区结为姊妹友好保护区。

30. 1996 年 3 月至 5 月，保护区与内蒙古大学自然资源研究所合作完成了《锡林郭勒草原自然保护区发展规划》。

31. 1996 年 8 月 1 日—8 月 3 日，国家环保局王玉庆副局长考察保护区。

32. 1996 年 8 月 9 日，全国人大环资委主任委员曲格平教授到保护区视察工作。

33. 1996 年 9 月 19 日—9 月 26 日，以澳大利亚普克马克生物圈保护区责任委员会主席施凯文为团长、包括责任委员会执行官迈克和委员会成员比尔的 3 人代表团首次访问保护区。

34. 1996 年 11 月，以盟委书记包俊臣为团长的保护区代表团一行 5 人应邀赴澳，对普克马克保护区及其毗邻地区进行了访问考察，实现了两保护区建立友好关系以来的首

次互访交流。

35. 1996 年底至 1997 年初，保护区 1 个工作人员在联合国教科文组织的资助下，到澳大利亚普克马克保护区进行了为期 2 个月的业务培训。

36. 1997 年 9 月，澳大利亚普克马克保护区责委会执行官迈克一行 2 人再次到保护区进行了为期一周的考察访问。

37. 1997 年 12 月 8 日，保护区被国务院批准晋升为国家级自然保护区。

38. 1997 年 12 月 26 日，盟编委下文批复保护区"五定方案"，保护区管理处为准处级自收自支事业单位，编制 21 人，下设办公室、管理科、科研科和公安派出所等四个职能科室。

39. 1998 年 1 月 12 日—1 月 20 日，以内蒙古自治区环保局吴国忠局长为团长、锡盟高云副盟长为副团长的保护区代表团应邀到澳大利亚，对普克马克保护区及其毗邻地区进行了为期 15 天的访问考察。

40. 1998 年 7 月 24 日，国家邮电部发行了以保护区为主题内容的地方邮票 1 张 3 票，1 张"锡林郭勒河曲"，3 票分别是"草甸草原"、"典型草原"和"杨桦混交林"。

41. 1998 年 7 月底至 8 月初，澳大利亚普克马克保护区责任委员会组织了以地方官员罗宾女士为团长的代表团一行 6 人，到保护区进行了为期 15 天的考察访问，澳方有意通过两个保护区间的友好关系扩大到中澳两地区间多方面的合作交流。

42. 1999 年 3 月 17 日—3 月 31 日，锡盟盟委副书记、行署常务副盟长苏和为团长的保护区代表团应邀赴澳，对普克马克保护区及其毗邻地区进行了为期 10 天的考察访问。

43. 1999 年 4 月，在全盟旅游工作会议上，盟委、行署决定将保护区白音锡勒区域定为全盟生态旅游开发区。

44. 1999 年 6 月 12 日，盟机构编制委员会下文，撤销原保护区管理处，成立保护区管理局。管理局为准处级事业单位，从盟环保监测站带编调入 4 人，财政全额拨款，下设行政管理科和资源管理科，保留公安派出所，但人员实行自收自支。同时免去阎永旺同志处长职务，改任为助理调研员，任命盟城建局副局长冯文思同志为保护区管理局局长。

45. 1999 年 8 月，占地 600 多 m^2 的"人与自然展览馆"和科研人员工作用房落成，并被定为盟级环境教育和爱国主义教育基地。

46. 1999 年 8 月 12 日—8 月 27 日，保护区向国家外国专家局申报资助项目"锡林浩特市可持续发展规划"获得批准，澳大利亚莫尔道兹大学的威廉姆-罗丝先生到保护区与保护区工作人员共同完成了这一项目。

47. 1999 年 8 月至 11 月，保护区 2 个工作人员在国家外国专家局和澳大利亚普克马克保护区的资助下，到普克马克保护区进行了为期 3 个月的业务培训。

48. 1999 年 10 月 14 日，由于过去几个经济实体经营管理不善，到管理局成立时已欠债达 100 多万元，保护区管理局经过半年多的运行，在广泛征询盟体改委、人事劳动局、就业局和社保局等部门的意见后，召开全体职工大会，最后全体通过，决定将保护区大自然招待所和大自然茶苑转制经营，部分职工下岗，再集体承包经营。

49. 1999 年 12 月 31 日，盟西乌旗土地管理局为保护区颁发了位于西乌旗乌兰淖尔苏木境内的海流特典型草原核心区土地使用证书。

50. 2000 年 3 月 18 日—4 月 5 日，以保护区管理局冯文思为团长的代表团一行 5 人，应邀赴澳对普克马克保护区及其毗邻地区进行了为期 15 天的访问考察，这次访问加深了友谊，继续了双方的交流合作关系。

51. 2000 年 4 月 15 日，钟启民到保护区工作，担任副局长职务。

52. 2000 年 5 月中旬，保护区经研究决定将实验示范牧场承包经营，扎格斯太度假村和造林基地实行目标化管理。

53. 2000 年 6 月，保护区党支部成立。

54. 2000 年 7 月 31 日—8 月 13 日，澳大利亚普克马克保护区环境监测专家肖妮娅女士到保护区进行了为期 15 天的工作，完成国家外国专家局资助项目“锡林郭勒保护区动物区系监测体系的建立”。

55. 2001 年 4 月，经局务会议研究，并经全体职工大会通过，决定将扎格斯太度假村和造林基地实行承包经营，管理局不再参与实体的经营活动。

56. 2001 年 4 月，由中国 MAB 国家委员会主持的保护区可持续管理课题开始在保护区启动。

57. 2001 年 6 月上旬，保护区管理局冯文思局长应邀到加拿大有关保护区进行访问考察，这是对中加内蒙古生物多样性保护与扶贫项目实施前的项目区管理者的培训。

58. 2001 年 7 月 29 日—7 月 31 日，中加项目专家团到保护区进行实地考察，并与保护区工作人员进行了讨论交流，中加项目正式启动。

59. 2001 年 8 月 4 日—8 月 6 日，第五次中国人与生物圈网络大会暨人与生物圈成立 20 周年纪念研讨会在保护区隆重召开。

60. 2001 年 8 月 9 日，盟行署下文，成立保护区管理委员会，盟委副书记、行署常委副盟长苏和任管委会主任，副盟长朝伦巴特尔和高云任副主任，管委会包括盟计划局、财政局、城建局、林业局、旅游局、公安局、农牧场管理局、畜牧局、保护区管理局、白音锡勒牧场、锡林浩特市政府和西乌旗人民政府等成员单位。管委会在保护区管理局设办公室，办公室主任由管理局局长冯文思兼任。

61. 2001 年 9 月 4 日，保护区旅游区杨桦林观赏通道通过工程验收，工程得到有关领导和技术人员的充分肯定。

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CHAPTER 1

STEPPE ECOSYSTEM DEGRADATION AND MANAGEMENT IN XILINGOL BIOSPHERE RESERVE

1.1 Introduction

Grasslands cover some 4.0×10^6 km^2 or 40% of China's total surface area. These grasslands are divided into three main types: temperate steppe, highland-frigid steppe and semi-tropical steppe. Temperate steppe grasslands, found in Northern China, forming the main part of these natural grassland, and is an important component of Eurasian steppe on the planet. One of the most representative and typical of these temperate steppe grasslands is the Xilingol steppe.

Xilingol Biosphere Reserve (XBR) is located in the center of this grassland, covering an area of 10,786 km^2, which includes a sandy-forest ecosystem, a steppe ecosystem, an agricultural ecosystem, and a moorland ecosystem, etc. Among these, the steppe ecosystem is the principle part, covering more than 90% of the reserve's total area. The most representative type of grassland ecosystem is the typical steppe ecosystem, followed by the meadow steppe ecosystem (see Fig. 1-1.).

The meadow steppe ecosystem is mainly distributed in the east of reserve, which is a hilly area, such as Wulasutai and Wocunturu mountains, and in the southern and south-eastern part of the reserve, which is a volcanic mesa and includes areas such as Huitengliang and Gasong mountains, with an altitude of more than 1300m. It is the moistest type of temperate steppe ecosystem with deep soil layers, high soil fertility and an abundance of flora. The core areas of the reserve, Chaganaobao and Huitengxile are representatives of the meadow steppe ecosystem. The productivity of the meadow steppe ecosystem is higher, but due to poor access to water source, it is mainly used as a natural meadow. This region is grass-store-station where most of Xilingol's hay is stored. However, due to favorable soil quality and climatic conditions, this area is also considered suitable for agriculture and is extensively reclaimed. For example, the Wocunturu and part of Yihewula was first reclaimed during the 1950s', with three

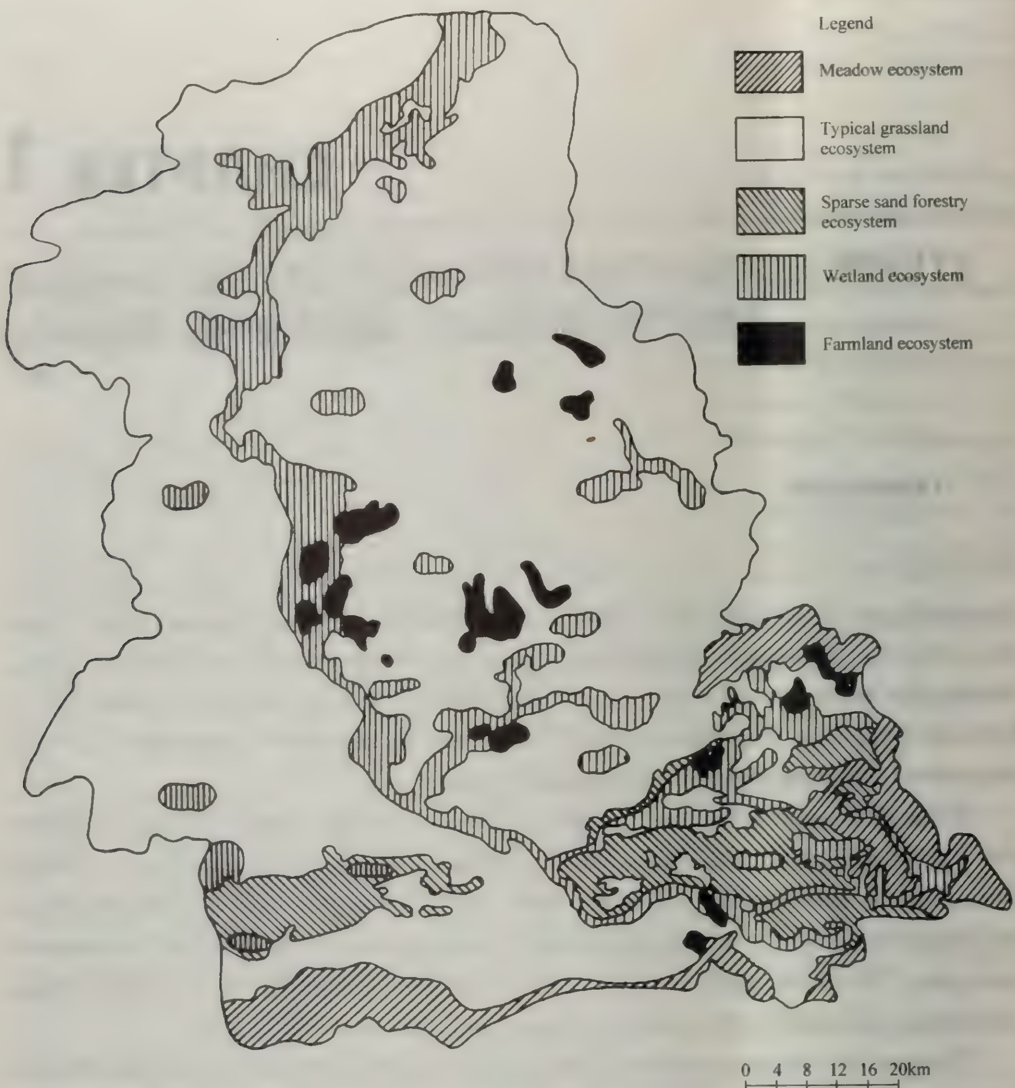


Fig. 1-1 Scheme of ecosystem type in Xilingol Biosphere Reserve

heavy extensive periods of reclamation in 1956, 1960 and 1969. The main reasons for the degradation of the ecosystem are the unsustainable grass-cutting, excessive reclamation and the rough and careless cultivation. The reclaimed land area in this region has increased more than 800 times from 200 mu* in 1953 to 164,800 mu in 1990. The typical steppe ecosystem is the greatest ecosystem in XBR and also the most representative and typical area of typical steppe ecosystem located in China's temperate

* 1 mu equals to 666.7 m^2

zone. It is widely distributed over the hilly area and Tala(Tala means lowland) in the middle, north and west of the reserve. The flora type, component, coverage, productivity and utility form of different area in this ecosystem are different. This is mainly due to the moist conditions prevalent in this region. The moist Yangcao typical steppe ecosystem is used for grazing and meadows, as well as reclaimed land, such as Bayinxile Livestock Farm. However, most of the area consists of typical *stipa* steppe ecosystem, such as Huanhuashute plain, Hailiute plain and Taolin Tala, where the climate is generally drier. The core area of Hailiute plain typical steppe has been established in this kind of area, with an area of 5.5 km^2. Grazing and grass cutting are the main activities on the typical *stipa* steppe ecosystem. The major reasons for degradation in this kind of ecosystem are heavy grazing and excessive grass cutting.

A long sandy zone cuts through the middle of XBR from east to west and forms a part of the Hunshandake sandy area, the fourth great sandy area in Inner Mongolia. Due to the sandy area's special soil substrate and rolling topography, a re-assignment of moisture and a change of heat quantity have taken place. This sandy ecosystem contains poplar-birch forests, open elm forests, some migrating dunes and a sandy steppe ecosystem. The Abuduertu and Taowuyinalegai core areas of the reserve are the representative sandy areas. As a result of the area's long term evolution, the loose sandy substrate was largely stable and the ecological balance of the sandy area was not destroyed. However since the 1950s, especially during winter, the grazing settlements have increased extensively. In addition, some unsustainable and excessive wood-cutting have activated the sand, resulting in increased areas of bare and eroded sand. As a result the ecosystem of the sandy area has started to degrade to varying degrees.

Wetland ecosystems in XBR mainly include rivers, lakes, runlets and their surrounding moorland, such as the Xilin river, Zhagensitannuoer lake and so on. Wetland ecosystems only cover a small area, for example, the area of Zhagensitannuoer lake is only 1.68 km^2 with an average water depth of 1.3 m, Xilin river and its tributaries, such as the Tulai river, are only about 10 km long, with the average water depth of Xinlin river 0.293 m and a yearly flow rate of 2.854×10^7 m^3. Although this ecosystem's area is small, it plays a significant role in the health of the grasslands. Degradation also occurred in the wetland ecosystem, mainly due to climate change and excess utilization. The degradation of the steppe ecosystem is a big eco-environmental problem in China. A report from National Environmental Protection Bureau (1998) showed that more than 90% of China's grasslands were degraded. Li Bo (1997) reported that the degraded grassland area ratio in Ningxia, Shaanxi and Shanxi provinces were even more severe, ranging from 90% to 97%. According to remote sensing data from 1985 to 1999, degraded steppe area in Xilingol Biosphere Reserve was 81% of the total reserve area, and still increasing. They also reported that the area of

medium-level degradation in 1999 had increased 38% since 1985 and that of severe-degradation of the steppe had increased 47%.

What is steppe degradation? Why does the steppe degrade? What is the process of steppe degradation? How can we control it? All of these questions are worthy of studying and will be discussed in the next section.

1.2 What Is Steppe Degradation

Grassland degradation is a principle form of desertification. There are different definitions of grassland degradation according to different experts. Li Bo (1990) defined it as a kind of state when the grassland ecosystem is far away from optimum conditions due to human disturbances such as grazing, reclaiming and wood cutting. Huang Wenxiu et al. (1991) thought that grassland degradation was a process where the ability of the grassland to support livestock decreased and led to decreasing productivity of animal-products. Chen Zuozhong (1988) thought that grassland degradation was not only the degradation of the grass, but also resulted in the degradation of the soil, so that it was the whole ecosystem that degraded. And then, following on from this viewpoint, Chen Zuozhong and Wang Shiping (2000) put forward the degradation periods of typical steppe ecosystem in temperate zones, and corresponding indexes for different components of the steppe ecosystem such as vegetation, rodents, soil microbes, and soil (see Table 1.).

1.3 Processes and Reasons for Steppe Degradation

Although Xilingol steppe has been utilized for over 1000 years, the Baiyinxile Livestock Farm began to show signs of degradation at least 50 years ago. Especially during the past ten years, the degradation has became more evident. Since 1999, plant communities in the steppe ecosystem have been degrading more seriously and obviously. Fig. 1-2 generally and qualitatively shows the process and trend of aboveground plant degradation and to some extent reflects the process and trend of steppe ecosystem degradation. Why has the degradation of the steppe ecosystem adopted this process and trend? It is related to the original causes of the degradation.

The degradation of the steppe ecosystem is a combined action between natural agents and anthropogenic agents, i. e. climate change and long term unsustainable grazing, grass cutting and system of land reclamation. From the perspective of the essential effects of substance circulation, unsustainable grass cutting is another form of grazing. Grazing and grass cutting all extract N, P, K etc. nutrients out of the steppe

Table 1 Index for different degradation periods of temperate typical steppe ecosystem

Degradation Degree	Plant Species Components	Aboveground Biomass and Coverage	Vegetation and Soil Surface Status	Rodent Indicator	Locust Indicator	Soil Status Indicator	Soil Animal Indicator	System Structure	Recovery Degree
I Low	No important change for primary community components, the quantity of *Aneurolepidium chinense* and *Stipa grandis* populations have decreased, *Artemisia frigida* and *Agropyron cristatum* populations have increased	20% to 35% decrease	Obviously vegetation decreases	*Ochotona daurica* Pallas	*Chorthippus* (A.) *fallax* (Zub.)	No evident change, surface hardness increases lightly and organic matter content decreases lightly	Enchytraoidae	No evident change	Natural recover fast after enclosure
II Middle	*Artemisia frigida* has become the dominant species, however most of the primary species on the *Aneurolepidium* and *Stipa* steppe remain	35% to 60% decrease	Vegetation disappears	*Microtus brandti* Radde	*Ch.* (G.) *dubius* (Zub.)	Soil hardness increases about one time and organic matter content obviously decreases	Acarina and Coleoptera	Animals of prey decrease, graminivorous rodent increase	Natural recovery is possible after enclosure
III High	More than half of the primary species have disappeared and the species composition has simplified, with *Artemisia frigida*, *Potentilla acaulis* and other small grasses dominanting	62% to 85% decrease	Soil surface becomes bare	*Microtus brandti* Radde	*Angarais barabensis* (Pall) *Myrmeleotettix palpalis* (Zub.)	Soil hardness increases about two times and the organic matter content decrease further. The quantity of coarse grain in the top soil increasse or results in salinization	Hymenoptera	Food chain becomes obviously restricted and the system structure simplifies, while the system function disadjust	Natural recovery is difficult, need to improve.
IV Excessive	Vegetation disappears, or leave some sparse *Potentilla acaulis* and annual weeds.	More than 85% decrease	Soil surface becomes bare, sandy and salinized	*Meriones unguiculatus* Milne-Edwards,		No utilization value		System crash	Need to reestablishment

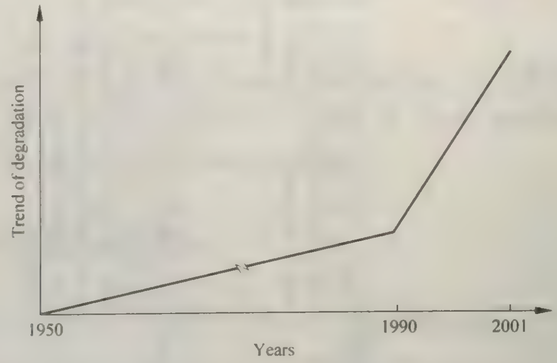


Fig. 1-2 Process of degradation in Xilingol Grazing Land

ecosystem. This is one of the output modes of nutrient substance. The unsustainable grazing system is closely related to the continually increases in grazing livestock, of the output of the livestock and livestock products such as meat, milk, leather, fur etc. , Fig. 1-3 summarizes the dynamic state of the grasslands from 1950 to 2000 for populations of humans and big livestock (cattle and horses), small livestock (sheep and goats), as well as the total livestock in Baiyinxile Livestock Farm.

When Baiyinxile Livestock Farm was established in 1950 it had only 20 staff, by 1962, the number had increased to 5,139, an increase of more than 200 times during past 12 years. In 1982, the human population on the farm reached 12,959, 1. 5 times that of 1962. The human population remained rather stable and then even decreased. By 2000, the population on the farm was 10,210, or 510 times that when it was first established (Fig. 1-3A). The main economic source of the farm is animal husbandry and therefore the increasing human population resulted in increasing numbers of livestock. The total number of livestock on the farm was 1,023 in 1950 and peaked in 1999 at 25, 2248 with 240 times increasement of the 1950 (see Fig. 1-3F). The introduction of reforms and the market economy during this period witnessed great changes in the ration between cattle, horses, sheep, goats, etc. Before 1975, the larger livestock of cattle and horses developed rapidly. For example, the number of horses on the farm was 17,261 in 1975, when it peaked (Fig. 1-3C) before decreasing a little bit. The reason for the increasing number of horses before 1975 was due to the fact that the farm had been used for war-horse breeding. As the demand for war-horses decreased, the feeding development of the horses was limited. In contrast, smaller livestock such as sheep and goats, especially goats, developed fast after the 1980s'. The number of goats in the range in 1962 was 2,283 and in 1997, it increased 13 times to 29,674. Market demand for goat pashm increased rapidly, as prices were high and herdsmen could obtain more income. This greatly stimulated the development of goats. Increasing livestock lead to

the heavy utilization of the grasslands and the grazing area utilized for every head of livestock decreased greatly. In 1950, the average natural grassland area used for every head of livestock was 350 hm^2, and in 2000, it had fallen 230 times to only 1.5 hm^2. *

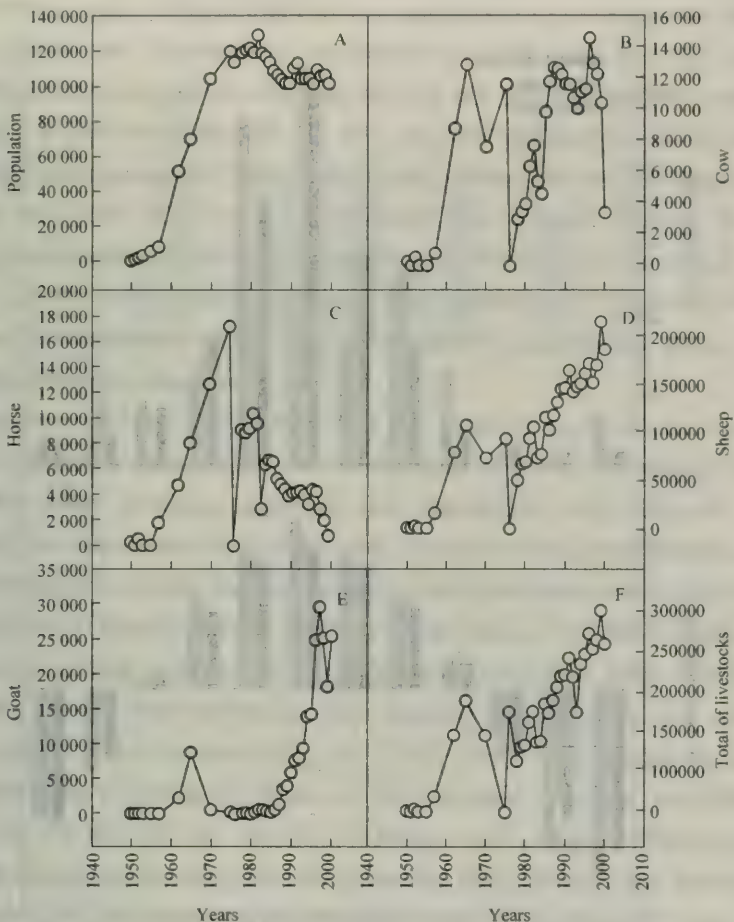


Fig. 1-3 Dynamic of population(A), cows(B), horses(C), sheeps(D), goats(E) and total livestocks(F) in Baiyinxile Livestock Farm

Prior to 2000, all of the livestock were grazed on natural grasslands, such as on Baiyinxile Livestock Farm in 1990, the area of artificial pasture and semi-artificial pasture was 46,000 mu or 0.87% of total area of the farm (Economics Department of Inner Mongolia University, Baiyinxile Livestock Farm research group, 1993). The continually increasing livestock increased the pressure on the natural grassland ecosystem causing its ongoing degradation. The degradation rate steadily increased, which was at first not easy for us to detect. However since 1999, three years' of

* 1 $hm^2 = 10^4$ m^2, the case for the following

abnormal climate, the degradation has intensified, changing the primary degradation of the grasslands. These abnormal climate characteristics witnessed a temperature increase and changes in precipitation allocation and mode (Fig. 1-4A, B).

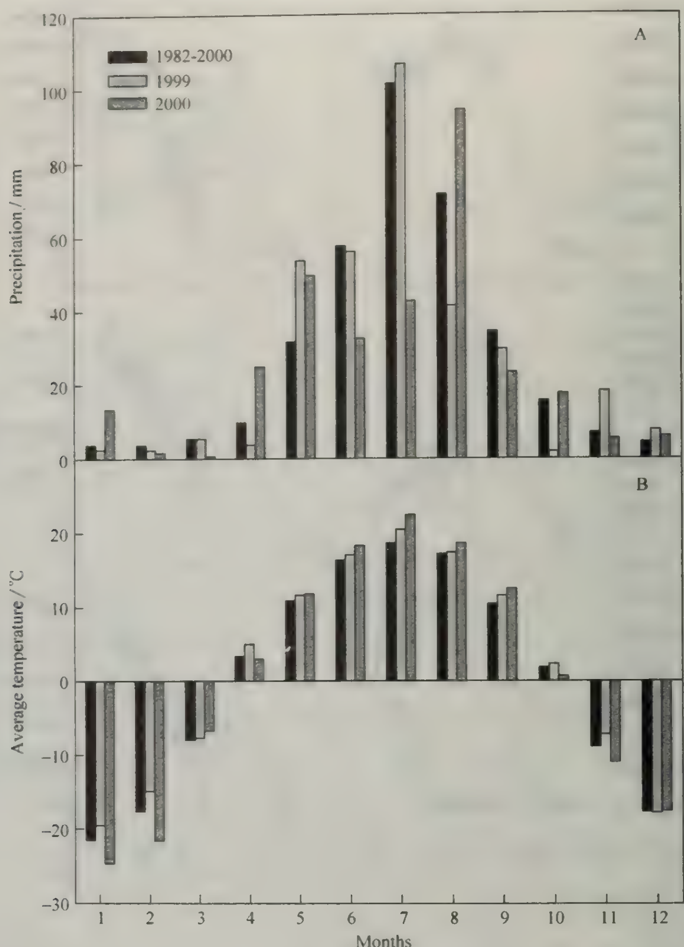


Fig. 1-4 Dynamic of precipitation (A) and average temperature(B) in 1999, 2000 and average values from 1982 to 2000 in Baiyinxile Grazing Land

In 1999, the annual average air temperature was 1.0℃ higher than the multi-year average value. In the coldest month of January, the average air temperature was 2℃ higher, and in the warmest month (July) it was 1.7℃. In 2000, the air temperature of winter was lower, but the average air temperature of July was 3.7℃ higher than the multi-year average value. These several indexes indicated one of the characters of the abnormal climate, that it is getting warmer. On the other hand, yearly precipitation was lower than the multi-year values. In 1999 and 2000, it was 16mm and 34 mm lower respectively. This is not so significant. However, it was the unsustainable allocation

and mode change of precipitation that greatly affected plant growth. In these steppe regions, precipitation from the last ten days of June to the second ten days of August is very important for plant growth. After the second ten days of August, air temperature begins to decrease, even if the amount of precipitation has no impact on plant growth. In 1999 and 2000, the allocation of precipitation could not meet the plant growth demands. Precipitation of the last ten days of July and the first ten days and second ten days of August in 1999 was only 4%, 81.6% and 28% respectively of the average value of ten-day multi-year averages. The precipitation during the last ten days of June and July in 2000 was only 29% and 14% of multi-year average values. The changing allocation of precipitation is also a sign of climate changes and a gradual reduction in precipitation. On the other hand, according to the statistics in 1999 and 2000, there was an increase in the incidence of rainstorms in relative to previous years, which also affected the precipitation function.

Based on these analyses, we believe that two interactive factors have led to steppe degradation, the first is unfavorable climate changes, and secondly unsustainable human activities. The other evidence supports this conclusion with different degrees of degradation in the same nature reserve under the same climate conditions. The plant species and productivity of the enclosed experimental grasslands have been significantly different from that of heavily grazed areas for many years. The results (Li et al. 1999) of this long term grazing experiment for 13 years showed that under the same natural conditions, the aboveground standing crop biomass decreased as the stocking rates increased. For six stocking rates, 0, 1.33, 2.67, 4.00, 5.33 and 6.67 of sheep per hm^{-2}, the accordingly maximum values of aboveground standing crop biomass were 140.50, 81.70, 75.39, 63.10, 44.40, 31.34 $g \cdot m^{-2}$. Fig. 1-5 clearly shows the influence of stocking rates on aboveground standing crop biomass and intake rates.

The results of our experiment revealed that if no grazing took place, the aboveground standing crop biomass is 1,400 $kg \cdot hm^{-2}$, and for light grazing, it is 810 $kg \cdot hm^{-2}$—2500 $kg \cdot hm^{-2}$, middle degree grazing, 630 $kg \cdot hm^{-2}$, heavy grazing, 440 $kg \cdot hm^{-2}$, excessive grazing, 310 $kg \cdot hm^{-2}$. Under different stocking rates, light, middle, heavy and excessive degree, the according aboveground standing crop biomass were only 60%, 45%, 30%, and 22% with no grazing control.

Compared to the influence of grazing on steppe degradation that affects a large area and is generally a slow process, the influence of reclaiming grasslands for cropping is sharp and fragmented. Reclaiming land always occurs in partial areas with better natural conditions of soil, vegetation, topography etc.. Therefore the distribution of reclaimed land is fragmented. However reclamation destroys all of the primary natural vegetation, changes the natural process of soil humus accumulation, accelerates the organic matter decomposition and releases in the reclaimed area. The degradation caused by reclamation

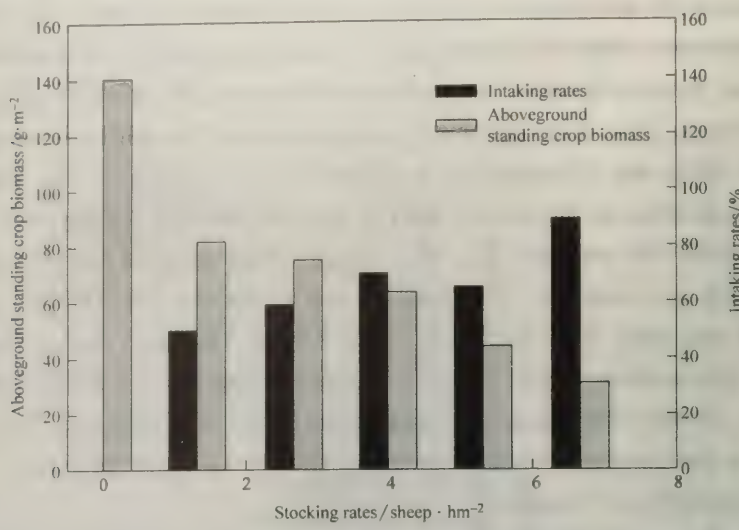


Fig. 1-5 The relationship of stocking rates and intake rates, aboveground standing crop biomass

is very fast, has different modes grazing, and it is difficult to anticipate its severity. The grasslands are usually reclaimed for farmland. However, it might become sandy land and result in desertification. According to an investigation, within the reserve (Economic Department of Inner Mongolia University 1993), 40% of 5000 mu sowing farmland was salinized, 50% of it is wind craved and became sandy, and included 4 blowouts with a diameter of more than 100m. Wang Jiuwen (1988) investigated the reserve reclamation and his results showed that after reclamation, the top soil organic matter content of natural grassland decreased from 3. 14% to 1. 35%, total N content decreased in more than half of the natural grassland. For soil physical character, the ratio of 0. 01 mm fine grains in total soil grains decreased from 30. 4% and 36. 4% to 11. 7% and 16. 8%, and the 0. 25 mm—1. 00 mm grains' ratio increased from 31. 4%—41% to 59. 3%—59. 6% and the soil texture changed from clay loam to coarse sand.

For the management of biosphere reserve, the small core areas are an important reason for the degradation of the ecosystem. The total area of these five core regions, established in 1987 is only 0. 17% of total area of the reserve or 18. 5 km^2. They are like isolated islands in the reserve and have difficultly functioning as they should.

Besides the above-mentioned reasons, another important reason for reserve ecosystem degradation is the cognitive deviation. How many functions does steppe ecosystem have? We have been apprehensive to this issue for a long term. We only take the steppe as an important animal husbandry base for meat, milk, feather and fur production, and excessively emphasis its economic function, but ignore its ecological function, such as water and soil retention, climate adjustment, environmental

improvement, sandstorm control, maintaining biodiversity and the important gene pool and so on. The grassland steppe of Northern China, especially XBR, is an ecological shield for Beijing and Tianjin and the great northern area. The ecological function of the steppe is as important as its economic function. This role can be easily understood through the increased frequency and intensity of the sandstorms during the past decade. The consequences of ecosystem degradation could be very severe.

1.4 Severe Consequences of Ecosystem Degradation

1.4.1 Biodiversity deprivation

During the past 30 years, the biodiversity of XBR has changed greatly, which concerns many people. The greatest regret is that *Tulipa uniflora*, a kind of rare and endangered plant species, has disappeared (Li 1993). Mono-flower tulip is a kind of xeric-mesial ephemeral, and its flowers are big and flamboyant, blooming in early spring with high ornamental value. Its distribution in the reserve indicates that the flora of the Mongolia steppe region has a primary relationship with that of middle Asia and the Mediterranean. The mono-flower tulip is distributed in a very limited region, and has been found only in the crush volcanic stone gaps on the top of Yihewula mountain, where several pieces of rare specimen of it were collected in 1979. For many years, scientists appealed to protect this rare plant species, but nobody paid any attention. Now this rare plant can not be found in the reserve because its living environment has been destroyed by excessive grazing. Another regret is the extinction of *Procapra gutturosa*. From the 1950's to 1970's, *Procapra gutturosa* had been herding in the reserve. They are an important component of the natural steppe ecosystem. But now they are seldom found because of intemperate hunting. In addition, *Koumo* (a kind of fungi living in Zhangjiakou region), lark and *stickle alfalfa* which are famous in the world, have now become very rare in the reserve due to the ecosystem degradation and environmental aggravation.

1.4.2 Productivity decrease

The productivity of plant communities in degraded ecosystem decreases 20%—100% over that of primary communities. The results of extensive investigations revealed that plant community productivity decreased 60% since the 1950s'. In 2001, it became so severe that the productivity of some *Stipa* typical steppe ecosystems was nearly zero under the influence of drought, sandstorms, excessive grazing and locust plagues. In autumn, the soil surface was nearly bare, with only some residual branches of

small-leave *caragane* gnawed by locusts and a little inedible annual *Salsola* left aboveground.

1.4.3 Simplification of the plant community structure

The plant community structure and aspects of degraded steppe ecosystem have changed greatly. The individual plants have become smaller and shorter, species component are simplifying. The ratio of good pasturage on the steppe has decreased greatly. Sometimes it looks like only some poisonous plants are left. Average height and coverage of plant community have decreased greatly. Sandstorms occur frequently and easily. Some experimental results show that sand is easily blow by wind when the community coverage is less than 50%. According to some investigations (Li 1988), most of total coverage of the typical steppe community was less than 50%, and only seldom were meadow steppe coverage more than 50%.

1.4.4 Aggravation of the ecological environment

The soil's physical, chemical and biological conditions and the micro-climate environment of the degraded steppe ecosystem are too only worsen. Although it may only happen gradually, all the changes, such as the soil surface hardness and top soil layer volume weight are increasing, soil grains are becoming coarse sandy grains, which aggravate the occurrence and frequency of sandstorms. The soil's organic matter and fertility are reducing. It is a very critical problem to know how to control the degradation of XBR's ecosystem.

1.5 Discussion of the Strategy for Steppe Ecosystem Degradation Control and Management

The degraded ecosystem should be classified before it can be properly managed and different steps adopted to control the degradation. True control effects and long-term arrangement should be emphasized in the management. Furthermore, this management should be integrated. The extent of steppe ecosystem degradation can be separated into three degrees: high, middle and light. The area of high degree degradation is 1.0 million mu in Baiyinxile Livestock Farm, more than 20% of the total range area (Economic Department of Inner Mongolia University 1993). It is mainly distributed around the residential area, villages, Xilin River, water sources, and Bayanhushuo region, also include parts of sandy land. The area of light degree degradation is also 1.0 million mu, about 20% of total Baiyinxile Livestock Farm area. It is mainly distributed at Huanghuashute, Wulasutai and Wocunturu regions and so on. The total area of

degraded steppe ecosystem is about 60% of the total range area. The three kinds of degraded steppe ecosystem should be treated differently.

(1) The high degree degraded steppe should be strictly fenced. The excessive degraded region, such as some parts in the sandy belt, should be fenced first, where the sand is easily disturbed becoming a source of the recent sandstorms. The herdsmen and inhabitants in the fenced region should be emigrated as ecological migrants. It is said that the ecological migrants' project has already begun in Inner Mongolia, the herdsmen living in bad living condition have been settled at other places. In Duolun region, the ecological migrants included 237 families, 933 persons in 2000 and 2001, thus allowing 72,000 mu of excessively degraded sandy land to be managed. In Xilingol reserve, enclosures have had a great effect on the annual plant community and can be clearly evidenced (see Fig. 1-6). The experimental results showed that the biomass of degraded grassland fenced in 1983 raised 1 times in 1984 (Chen et al. , 1997). Generally, the recovery of plant community will increase after three years of fencing. Certainly, the degraded grasslands have recovered greatly within 1 year to 3 years after being classified as light degree degradation, and also due to improved climatic conditions. It is general not necessary to use airplane sowing for the recovery of fenced areas. Even within areas of excessive degradation, definite seeds will be kept in the soil seed bank, and lots of perennial plants still remain there. As long as the conditions become adaptive, the natural recovery is possible. On the esplanades for yearly rotational grass cutting, there are 135,000 living seeds in the top 12 cm soil layer per mu of land, i. e. 2,032 seeds per 1 m^2 of land.

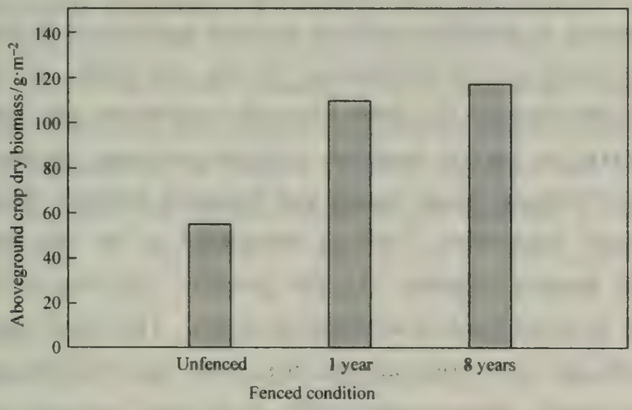


Fig. 1-6 A comparison of biomass in degraded steppe among unfenced area, fenced area for 1 year and fenced area for 8 years

(2) The middle degree degraded steppe should be rationally utilized according to certain grazing prohibitions. It is very important that grazing is prohibited during spring. Reducing the number of present livestock is necessary for grazing prohibition

and enclosure. According to the grass-livestock equilibrium principle, there are excess livestock within the reserve (Economic Department of Inner Mongolia University 1993). They have greatly exceeded the most suitable capacity for the grasslands. Therefore, the number of livestock must be reduced. How should this be implemented? One method is to increase the tax for excessive livestock to limit the occurrence of excessive large livestock. The second method is to clear the official ranges in the reserve. All of the ranges held by national units such as the army and government, should be cleared and the steppe returned to the herdsmen. According to one investigation (Economic Department of Inner Mongolia University 1993), in 1990, Baiyinxile Livestock Farm carried 336,500 head of livestock during the warm season, of which 21,000 or 6% were managed in communes. During the cool season, the livestock on the communes was 15,000 sheep units, also 6% of the total number of 250,800 sheep within Baiyinxile. The third method is to cease the practice of compulsory livestock grazing. Some persons hold very little power and if they and the herdsmen have a direct relationships with officials, veterinary doctors, or drivers etc. , then they can utilize these functions to often force their livestock to be grazed by other herdsmen. The livestock number of this kind is quite significant and should be controlled. Certainly, if possible, it is important to invest in managing the largest areas of middle degree degraded steppe.

(3) Light degree degraded and no degraded steppe should continue to be rationally utilized according to the grass-livestock-equilibrium principle. At present, the available method is to establish paddocks and apply the rotation grazing system. Herdsmen who have not adopted this method should be gradually instructed.

(4) It is necessary to establish artificial pastures appropriate to the local conditions and to develop intensive animal husbandry. On the one hand, we should utilize the steppe under the directions of the grass-livestock-equilibrium principle. On the other hand, we should try our best to establish artificial pastures, increase forage supply, reduce the conflicts between forage supply and livestock demand, develope confined or semi-confined animal husbandry. This is considered to be the key for structural adjustment of the pasture industry. In the reserve, selecting proper land is very important for the establishment of artificial pastures. The lower land between hills, riverside basins and left over areas are the best place for artificial grasslands. These lands are relatively small, approximately 10% of the total land area of the reserve. In addition, the composition of perennial and annual grasses are very important for artificial pasture establishment. Experimental results over several years showed that many plant species adapted to this region, such as some pastures of Gramineae, *Aueurolepidium chinenses*, *Elymus sibiricus*, *Bromus inermis*, *Elymus dahuricus etc.*; as well as some pastures of Leguminaceae, *Medicago falcate*, *Medicago sativa*,

Melilotoides rutheuicus, *Melilotus offieinalis* etc. ; and some annual forage grass (Qi 1998).

(5) The application of integrated measures should be adopted to develop the economy of the pasturing area, so as to increase the income of herdsmen and reduce the pressure on the natural steppe. The number of livestock has been steadily increasing over the long term in an attempt to raise the living standards of the herdsmen. This is not in line with the principle of sustainable development. Other measures like encouraging herdsmen to develop ecological tourism, enhancing the livestock yield etc. should also be taken so as to reduce the using intensity of steppe.

(6) For the management of the reserve, the following several aspects are more important and critical for steppe ecosystem degradation control.

① Enlarge the core area of the reserve and adjust its function. Currently the core area accounts for only 0. 17% of the total reserve area. It is too small to exert its influence on the whole reserve. Core area enlargement is imperative under the existing situation and core protective belt programming is also required. This should ensure the integration of the Hailiute typical steppe and Chaganaobao meadow steppe core areas. The steppe ecosystem of the core areas should be strictly managed and utilized in a balanced way. The previous practice of complete preservation for the core areas should be examined. Because, without being reasonable utilized by livestock, the steppe will also degrade. The natural plant and animal community have already existed harmoniously for a long time, Largely, as a consequence of natural selection, The *Procapra gutturosa* continued to inhabit the area constituting an integrated and balanced steppe plant community ecosystem. We assume that there should be three situations within the core area belt. Firstly, a small strictly observational area. The aim of which is to observe the plant community dynamics and process under the conditions of no animal disturbance. Secondly, the creation of core areas where strictly managed grazing and grass cutting is permitted. A balance between the grass and livestock should be emphasized. In this area, the natural steppe should maintain a level of sustainable development. Although its area is very small, it can be seen as the primary state of steppe recovery. This area would be limited to the Hailiute typical steppe and Chaganaobao meadow steppe, or about 300 km^2, to be managed to develop experience according to strict laws. Once the area is successful, these areas can be once again enlarged. Thirdly, a production demonstration area should be established with herdsmen directly taking part in its programming.

② Highlight the special features of the steppe. The Hailiute plain and its surroundings are the main region which should be successfully controlled. The features of the reserve are steppe characteristics. Firstly, we should try our best to protect and manage the typical steppe and meadow steppe, the most representative of which are

Hailiute plain and Chaganaobao. It is currently the best preserved due to its inconvenient location and remoteness. More and more grazing and reclaiming activities are the main factors that impede the management of this region. Resettlement and measures for prohibiting grasslands reclamation must be realized. The area of farmland should be gradually reduced, thus allowing the steppe naturally recovery.

③ Apply for funding support from China's New National Ecological Functional Region Program. The Xilingol steppe is very important for the ecological security of Beijing and Tianjin region and acts as an ecological shield. As witnessed in recent years with the more severe sandstorms whose occurrence shares a close relationship with the breakdown of vegetation within the reserve and surroundings. In order to ultimately control the degradation of the steppe ecosystem in this region, contending for more national support and attention are very important. So we think the realization that raising the function of the reserve to a high level on the whole national scale is very meaningful. How to apply? How to plan? And how to manage all need to be studied. The State Environmental Protection Administration is currently designing and planning this program and therefore it would be appropriate to follow its progress.

1.6 Suggestions

For the above-mentioned several problems, the following suggestions are offered.

(1) Apply to be a national ecological functional region, so as to contend for more support and intensive attention.

(2) Enlarge the core areas and establish a core protective belt.

(3) Highlight the special characteristics of the Hailiute plain and its surroundings, so as to ensure ecological resettlement plan is carried out smoothly.

(4) Make plans for the classification of the control of degraded steppe ecosystem, including: enclosure and prohibitions on grazing; returning the steppe to the herdsmen; reducing the number of livestock; establishing artificial pastures; stall feeding and semi-stall feeding of livestock etc..

CHAPTER 2

DYNAMICS OF GRASSLAND DEGRADATION IN XILINGOL BIOSPHERE RESERVE

2.1 Introduction

Xinlingol Grassland Biosphere Reserve (XBR), Inner Mongolia, is the first grassland biosphere reserve establishing in 1985 in temperate grassland in China. The range of XBR includes whole Xinlin River Basin. Total area is about 10,000 km^2. At the start of building of XBR, landscape of the Xinlin River Basin was a temperate grassland ecosystem reserving very well in the north of China, having significantly typical and representative in grassland zone on Inner Mongolia Plateau. This region is also one of the most important husbandry bases in Inner Mongolia. The characteristic and aim of XBR is to conserve the biodiversity and integrity of structure and function of temperate grassland ecosystem, meanwhile to exploit reasonably grassland resource in the Xinlin River Basin.

The Xilin River is well known and important in Inner Mongolia. The grassland in the Xilin River Basin is one of the most representative steppes in grassland region of northern China. The eastern part belongs to the low mountain and hill region of west foot of the Daxing-An Mountain with an average elevation of approximately 1,500 m. Topographically, it gradually gets lower from southeast to northeast, and the lowest position is only 902 m in the lower reach of the Xilin River Basin. The landform in the Xilin River Basin can be divided into several obvious regions. The three ranks smooth lava tableland is located in the south part of the Xilin River, the middle and lower reach of the Xilin River Basin is one part of the Inner Mongolia Plateau characterizing alternating distribution of low mountain, hill and plateau. The region between above two big landform unit is a part of the Hunshandake sand land.

The climate is typical of temperate grassland with annual rainfall of 350 mm. From the southeast to the northeast, many climate factors, including temperature and frost-free period, all gradually increase, only rainfall gradually decreases. Annual average temperature is 2.0℃ on the Xilinhaote in middle-low reach in the Basin.

The aim of building Xinlingol Grassland Biosphere Reserve is to reserve typical grassland ecosystem on Inner Mongolia Plateau. In XBR, five core areas were designed. They are (1) core area of meadow grassland ecosystem in Chaganaobao; (2) core area of grassland ecosystem on basalt tableland in Bayanwula; (3) core area of typical grassland ecosystem on Hailiute plain; (4) core area of *Peace meyeri* in Taowuyintaolegai; (5) *Populus davidiana* and *Betula plytyphylla* in Abutouer Mountain. However, under the direction that the first function of grassland ecosystem is to develop husbandry, for the large area of grassland ecosystem besides core area, the management and conservation of grassland ecosystem was not earnestly carried out. With the continuous increase of grazing intensity, grassland ecosystem in XBR was gradually degrading.

Grassland provides land resource for rangeland and mowing areas. Grassland degradation often implicates a decrease in value of grassland resource. In this aspect, many researchers have used the term of grassland degradation. Grassland degradation is a process in which grassland production decreases and environment deteriorates due to poor management, over grazing, and adverse ecological and geological conditions. In 1999, Li Bo defined grassland degradation as the decrease of quality, production, economic potential and utility function of grassland including plant and soil, deterioration of grassland environment, reduction of biodiversity or complex rank, abatement and lose of restoration function. Vegetation degradation is one of main features of grassland degradation. The studies on grassland degradation can be divided into research at small (local) scale, and regional (large) scale. For the former, plenty of studies were done. With the development of spatial information technology, the research on grassland degradation at large scale gradually follows up. However, it still lack research on the change of area, rank and spatial pattern of grassland degradation at region level in Inner Mongolia. For study on grassland degradation at regional level, compiling vegetation map is the first step. Building the diagnosis model of grassland degradation succession is also necessary for ranking grassland degradation. Remote sensing data, geographic information system (GIS), and layer analysis have been widely used in monitoring and research of ecological and environmental changes at middle and large scale. In this paper, we report the research on area, rank, and spatial pattern of grassland degradation in Inner Mongolia, especially the analysis on grassland degradation according to different landform types and using grassland degradation index.

2.2 Method of Research on Grassland Degradation

For the monitoring grassland degradation at large scale, the combination of remote sensing data, GIS and field survey is a main approach. Based on the compiling of vegetation map of XBR in 1985 and 1999, grassland degradation maps were compiled.

The result of grassland degradation monitoring at regional level should contain the

information of both degradation area and rank. In the effort of developing indicators of sustainable development, the aggregation of environmental indicator, especially the construction of environmental index is a current trend. For one environmental issue, it is best to use fewer indicators. Using grassland degradation index incorporating information of degradation area and rank, this paper calculated the value of grassland degradation index in whole Xilin River Basin and different landform types in 1985 and 1999.

2. 2. 1 Grassland degradation succession and compiling of grassland degradation map in XBR

Using 1 : 250,000 TM image in 1999 and 1 : 300,000 TM image in 1985 of XBR, combining field investigation, conferencing the map of XBR and 1 : 1,500,000 vegetation map of Inner Mongolia, the vegetation maps in 1985 and 1999 of XBR were compiled. 18 kinds of community types were divided. Digitizing vegetation maps, then under the support of ARC/INFO and ARC/VIEW, according to degradation succession of *Stipa grandis*+*Leymus chinensis* grassland and *Stipa krylovii* grassland in XBR, we compiled the grassland degradation map in XBR. We concluded that, under over-grazing, above communities degraded to *Artemisia frigida* steppe, in some over-grazing area, degraded to *Cleistogenes squarosa* steppe.

In XBR, the appearance of plenty of *Caragana microphylla* shrub is also an obvious sign of grassland degradation. However, it is difficulty to interpret directly on TM image. The ground survey is very important and necessary for interpreting *Caragana microphylla* shrub.

The reason of grassland degradation is much complicated. The building unified indicators for grassland degradation is not easy. Li Bo concluded, for grassland degradation caused by over-grazing and mowing, the indicators such as floristic composition, aboveground biomass and coverage, ground coverage, soil, structure of ecosystem and recovery can be used to divide rank of degraded grassland. Li Bo divided degraded grassland into four degrees that are light, medium, heavy and extreme. In order to construct grassland degradation index, we divided degraded grassland into three degrees that are light, medium and serious. The abandoned farmland in grassland area is also considered as degraded grassland.

The degradation succession of *Leymus chinensis* grassland is similar to *Stipa grandis* steppe. Finally, because of over grazing, *Leymus chinensis* grassland degrades to *Cleistogenes squarrosa* + *Artemisia frigida* grassland in the Xilin River Basin. In the lower reach of the Xilin River Basin, owing to overstocking, climax *Stipa krylovii* grassland has almost disappeared, light degraded *Stipa krylovii*, *Cleistogenes squarrosa*, *Artemisia frigida* steppe, heavy degraded *Cleistogenes squarrosa*, *Artemisia frigida*, *Stipa krylovii* grassland are widely distributed.

2.2.2 Geomorphology map and overlay with grassland degradation map

Basing 1 : 250,000 topographic map and Landsat TM image, geomorphology map of the Xilin River Basin was complied. The area of river terrace in the Basin is smaller, therefore, in geomorphology map, it wasn't indicated. Grassland vegetation mainly distributes in high plain, hill, lava tableland and low mountain. Under the support of geological information system (GIS), we overlaid grassland vegetation degradation map and geomorphology map. The area of different degradation rank of grassland vegetation in different landform types and in whole Xilin River Basin was calculated.

2.2.3 Building grassland degradation index

For the indicators of grassland degradation, above ground biomass is an important indicator. For the four degradation degrees divided by Li bo, the decreasing percentage of light, medium, heavy and extreme degraded grassland is light 20%—35%; medium 36%—60%; heavy 61%—85% and extreme > 85%. In this research, grassland degradation was divided into three ranks that are light, medium, and serious degradation. In order to building grassland degradation index, the decrease of above ground biomass of light degraded grassland is determined as 1/3, medium degraded grassland is 1/2, and serious degradation is 2/3. A direct consequence of grassland degradation is the decrease of above ground biomass. When degradation area and degradation rank was "aggregated" into grassland degradation index, above ground biomass was taken as weight factor.

When grassland degradation index was calculated, per area of light degraded grassland was defined as 1 grassland degradation unit (GDU). Therefore, per area of non-degraded grassland was defined as 0 GDU; per area of medium degraded grassland was valued as 1.5 GDU, and per area of serious degraded grassland was valued as 2 GDU. The formula calculating grassland degradation index was as follow:

$$GDI = \sum_{i=1}^{3} W_i \cdot S_i$$

Where GDI = grassland degradation index;

i = 1, 2, 3, represent light, medium and serious grassland degradation;

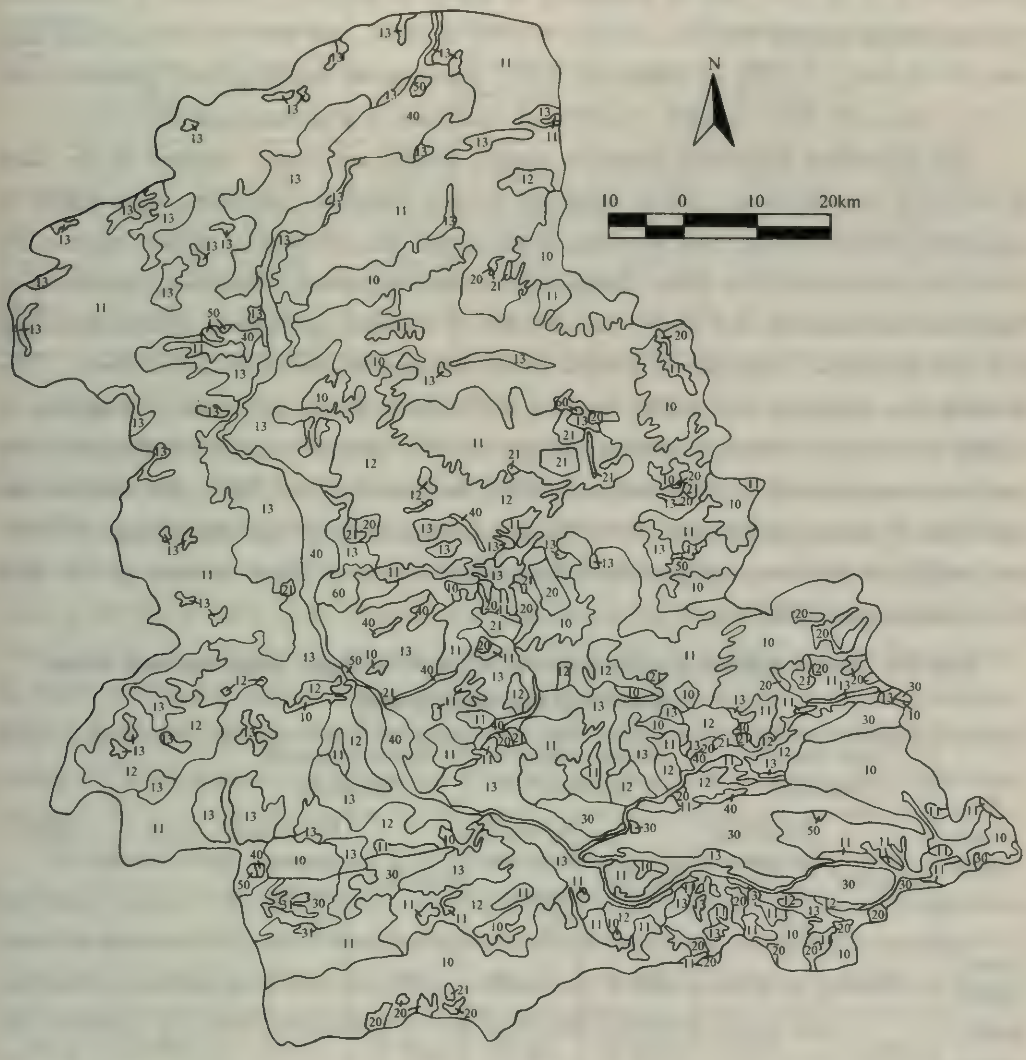
W_i = weight value of grassland degradation of rank i, light rank: 1, medium rank: 1.5, serious rank: 2;

S_i = area of grassland degradation in rank i;

2.3 Current Status of Grassland Degradation

Fig. 2-1 is the grassland degradation map of XBR in 1999. The total area of grassland

degradation caused by over grazing and mowing in XBR in 1999 was 7,689.3 km^2, 71.86% of area of XBR, 81.70% of total area of grassland in XBR. For the degraded grassland caused by over grazing and mowing, area of light degradation was 3,678.8



Legend

Ⅰ. Grassland degradation
10. Non-degraded grassland
11. Light degraded grassland
12. Middle degraded grassland
13. Serious degraded grassland
Ⅱ. Farmland and abandoned farmland
20. Farmland
21. Abandoned farmland
Ⅲ. Sandland in grassland zone
30. Fixed and semi-fixed sandland
31. Movingsandland
Ⅳ. Meadow
40. Meadow
Ⅴ. Waters
50. Waters
Ⅵ. Urban
60. Urban

Fig. 2-1 Grassland degradation map in XBR in 1999 (1 : 1,600,000)

km^2, 34.38% of area of XBR, 39.08% of total area of grassland in XBR, area of medium degradation was 1,933.6 km^2, 18.07% of area of XBR, 20.54% of total area of grassland in XBR. Area of serious degradation was 2,077.2 km^2, 19.41% of area of XBR, 22.07% of total area of grassland in XBR. In addition, the area of abandoned farmland on grassland was 84.30 km^2, 0.79% of XBR, the area of moving sand land was 17.57 km^2, 0.16% of XBR. In 1999, the area of non-degraded grassland was 1,722.7 km^2, 16.10% of XBR, 18.30% of total area of grassland in XBR.

The grassland vegetation types in upper, middle and lower reaches of the Xilin River Basin are different, utility intensity is also different, therefore, the degree of grassland degradation in three sections is not same. The division of upper, middle and lower reaches of the Xilin River Basin had not been reported. According to feature of landform, geomorphy, soil zone, and division of meadow grassland, typical grassland and dry grassland, this paper divided three sections of the Xilin River Basin. The dividing line of upper and middle reaches is Haolaitu River, and the dividing line of middle and lower reaches is Bariqin Mountain. The area of upper, middle and lower reaches is respectively 2,659.4 km^2, 5,816.6 km^2 and 2,217.3 km^2. We overlaid the zone map of upper, middle and lower reaches, and grassland degradation map of XBR, and calculated the area and grassland degradation index of three sections of the Xilin River Basin, see Table 2-1.

Table 2-1 Area of degraded grassland and value of GDI in the upper, middle and lower reaches in the Xilin River Basin in 1999

Xilin River Basin	Light degraded grassland		Medium degraded grassland		Serious degraded grassland		GDI	GDU
	Area/km^2	Percentage in upper reaches /%	Area/km^2	Percentage in middle reaches /%	Area/km^2	Percentage in lower reaches /%		
Upper reaches	352.5	13.25	288.7	10.88	246.1	9.25	1,277.7	0.48
Middle reaches	1,755.3	30.17	1,630.3	28.03	1,409.6	24.23	7,020.0	1.21
Lower reaches	1,570.8	70.84	18.5	0.83	421.5	19.01	2,441.6	1.10

In the meanwhile, the degree of grassland degradation in different landforms is also different in XBR. Table 2-2 gives area and grassland degradation index of four landforms of the Xilin River Basin.

Table 2-2 Area of degraded grassland in four landforms and value of GDI in the Xinlin River Basin in 1999

Landform Type	Light degraded grassland		Medium degraded grassland		Serious degraded grassland		GDI	GDU
	Area /km^2	Percentage of respective land form /%	Area/km^2	Percentage of respective land form /%	Area/km^2	Percentage of respective land form /%		
Low mountain	53.0	6.21	141.8	16.63	0.1	0.01	265.9	0.31
Hill	1,064.9	46.56	395.2	17.28	519.1	22.69	2,695.9	1.18
Tableland	713.5	44.06	139.0	8.58	167.5	10.34	1,257.0	0.78
High plain	1,818.0	36.56	1,253.0	25.20	1,368.3	27.52	6,434.1	1.29

Showed in Table 2-1 and Table 2-2, the order of value of GDI of upper, middle and lower reaches in XBR was middle>lower>upper reaches, the order of value of GDI of four landforms in XBR was high plains> hill> lava tableland > lower mountain.

The spatial distribution of grassland degradation in XBR is complicated. At large scale, the grassland degradation in middle and lower reaches was obvious. There are some distributing center area of grassland degradation in whole XBR, such as region of river terrace, the Maoden Plain, the Hailiute Plain, the Xier Plain and the Gong Plain. In the Xier Plain, the primary grassland vegetation is *Stipa grandis*, *Leymus chinensis* steppe, however, owing to high grazing intensity, the primary grassland has not been found, it was replaced by *Artemisia frigida* grassland and *Cleistogenes spuarrosa* steppe.

On remote image, along the Xilin River, grassland degradation was characteristic of belt distribution. On the Maoden Plain and the Hailiute Plain, grassland degradation was characteristic of spot distribution centering inhabitant spot, the boundary of degraded grassland spot was very clear. However, in lower reach of Xilin River Basin, the feature of grassland degradation was even distribution in larger area.

2.4 Dynamics of Grassland Degradation in XBR from 1985 to 1999

Table 2-3 showed the grassland degradation in XBR in 1985 and 1999. In 1985, the total area of degraded grassland was 7,191.0 km^2, 67.19% of XBR; in 1999, the area was 7,689.3 km^2, 71.86% of XBR. From 1985 to 1999, the area of degraded grassland increased 498.3 km^2, which indicated that, in these 15 years, the average increasing rate of grassland degradation was 33.2 $km^2 \cdot year^{-1}$.

Although the increase of area of degraded grassland was only 498.3 km^2, the

degradation rank had changed obviously. Table 2-3 showed the areas and percentage of grazing grassland having different degraded rank in XBR in 1985 and 1999.

Table 2-3 The areas of grassland having different degradation rank in 1985 and 1999

	Light degraded Grassland		Medium degraded Grassland		Heavy degraded Grassland	
	Area/km^2	Percentage of total area/%	Area/km^2	Percentage of total area/%	Area/km^2	Percentage of total area/%
1985	4,377.6	46.41	1,399.1	14.83	1,414.2	14.99
1999	3,678.8	39.08	1,933.6	20.54	2,077.2	22.07

2.5 Analysis on Reasons of Grassland Degradation in XBR

In the past decade, the grassland in XBR was becoming more and more degraded. The main cause is the increase of both human population and livestock number. Of course, grazing pattern, drought, rodent infestation also exacerbated the situation.

2.5.1 Continuous increase of population

In Xilinhaote where XBR is located, population had risen from 116,700 in 1985 to 136,900 in 1999, increased 17.31%. For example, the region in the southwest of XBR is originally an area having less population. For the Huitengliang third rank lava tableland in this region, owing to short of water, population was few, and was not a grazing region. The grassland vegetation, specially, meadow grassland vegetation in this area reserved very well. However, in recent years, inhabitant spot increased obviously, especially, the movement of population out of the nearby villages onto grassland, grassland vegetation in this region appeared light degraded feature. Ten years ago, *Caragana microphylla* shrubs didn't exist, however, at present, the grassland in some area appeared obvious *Caragana microphylla* shrubs.

2.5.2 Rapid rise of number of livestock

With the fast development of husbandry, the number of sheep in Xilinhaote went up from 618,400 in 1985 to 1.133 million in 1999, increases 83.28%. Above data indicated that the pressure of human activity on grassland ecosystem had became more and more heavy, adding continuous climate dry from 1999 to 2001, degradation of grassland in XBR had become more serious.

2.5.3 Poor grassland management

The poor grassland management includes lots of aspects. First, grazing on grassland is continuing almost every day in a year. Second, area of artificial grassland is little, Its important is yet not taken enough attention. Third, measurement of seasonal grazing was not carried out completely.

2.5.4 The location of main function of grassland ecosystem

The grassland degradation in XBR is related closely with the location of grassland ecosystem in the north of China. In the understanding on grassland ecosystem in past in China, the first function of grassland ecosystem is husbandry. Under the direction of this cognition, human exacted lots of livestock product without control, the direct result is grassland degradation in large area. The grassland degradation in XBR is an example. Therefore, the relocation of grassland ecosystem in the north of China is an urgent and troublesome task facing scientists, manager and government decision-maker. The key point is that we should relocate the first function of grassland ecosystem as an important "green" ecological belt in north of China firstly; Then the important husbandry base perhaps, the newly understanding of grassland function would be significant to the future development of grassland ecosystem in Inner Mongolia.

CHAPTER 3

BENEFIT EVALUATION OF STOCKBREEDING IN XILINGOL BIOSPHERE RESERVE

Xilingol Biosphere Reserve (XBR) is a grassland ecosystem, which is mainly composed of meadow grasslands. These representative and typical steppe are some of the best natural pastures in the world. In addition to the grassland ecosystem, XBR also includes desert steppe, sandy-forest, boscage, wetland steppe and swamp. All of these form a well-regulated yet complex ecosystem which offers superior conditions for stockbreeding development. Animal husbandry has been maintained as the main industry by the local Mongolian population in the region for generations.

However, the Xilingol grasslands have encountered severe degradation during the past several years. As a result, the beautiful scenery which is recalled in the famous lines 'moderate wind blowing, flourishing grass swaying, flocks and herds playing' has almost disappeared. In most parts of the Xilingol grasslands, the grass is only about 10 cm high with large patches of bare soil. The causes for this state of affairs are twofold: unfavorable climatic conditions and uncontrolled human behavior. On the one hand, water shortages have retarded grass growth due to the ongoing drought of recent years. Furthermore, the weakened ecosystem has been more vulnerable to locust plagues, which further reduces the chances of grassland recovery. On the other hand, because the grassland was distributed to herders based on the Household Production Responsibility System, the economic interests of herders are directly related to the level of production. In order to increase their income, herders have been continuously increasing livestock numbers. As a result, livestock numbers have increased three to four times during the past forty years, which has severely exceeded the carrying capacity of the pastures. Here we are not going to condemn anyone, but our goal is very definite: restore the grasslands as soon as possible and protect the eco-environment of Xilingol grasslands. Practice has shown that the present stockbreeding experience of simply relying upon increases in livestock numbers is not an economically sustainable

way since it is highly dependant upon weather conditions. To steadily improve the living conditions of local herders, the industrial structure of Xilingol needs to be urgently modified.

Through an economic analysis of stockbreeding, a financial analysis of an individual household and a study of the economic income distribution of different stakeholders in Baiyinxile Livestock Farm, the largest farm in XBR, as a case study, this paper indicates the reasons for the problems with stockbreeding development and its relationship to the present grassland degradation in Xilingol. Based on this analysis, the necessity and pressure to modify the industrial structure is presented.

3.1 Cost-Benefit Analysis of Stockbreeding in Baiyinxile Livestock Farm

Due to the typical nature of Baiyinxile Livestock Farm, it was selected as study area in this paper. We conducted an economic analysis of stockbreeding in Baiyinxile Livestock Farm from two points of view: firstly, from a macroeconomic point of view, in which economic analysis was used and the environmental cost was assessed in order to indicate the actual economic contribution of stockbreeding to the Xilingol grasslands; the other was from a microeconomic point of view, in which a herder household was selected and a financial analysis was developed to calculate the household's net income from stockbreeding.

3.1.1 Methodology

The differences and comparison between the macroeconomic analysis for Baiyinxile Livestock Farm and the microeconomic financial analysis for the herder household are listed in Table 3-1.

Table 3-1 Comparison between the economic and financial analysis

Contents of comparison	Financial analysis	Economic analysis
Points of view	Benefit and loss of stockbreeding from the perspective of a herder household	Social opportunity cost and benefit from the perspective of social welfare in Baiyinxile Livestock Farm
Results	The household's net income	The retained profit of society
Objectives	Indicate the motives of individual herder's stockbreeding	Confirm the actual cost and benefit of stockbreeding and decide to invest in it or not

Continued table

Contents of comparison	Financial analysis	Economic analysis
Tax	Part of a herder's income paid to the local revenue	Part of the social total profit
Loan	An increase in capital	Transferable payment
Interest	Financial cost which increases the cost	Transferable payment
Income Distributions	Based on the net profit of all the elements of production	Excluded in economic analysis and can be studied respectively

The following two formulas could be obtained from Table 3-1.

(1) Retained profit of society = (direct benefit from stockbreeding + external or environmental benefit) − (direct cost of stockbreeding + environmental cost)

(2) A herder household's net income = Total income − Total cost

Presently, the Xilingol grassland ecosystem has encountered serious degradation due to various man-made and natural reasons, especially due to irrational patterns of economic development, which has severely restricted economic development in XBR. Once the environment is destroyed and the fundamental conditions for ecosystem recovery are unable to be met, it is impossible to develop a substitute industry to develop the economy of XBR. Land degradation decreases the productivity of the grasslands and the soil quality and leads to decreasing food productivity. Moreover, severe and frequent disasters are more likely to occur, endangering people's health and livelihoods. All of these show that the environment is very important to economic development as well as for human welfare. Neglecting environmental damage will threaten the efforts for achieving sustainable development (Pearce & Warford 1996). Therefore, in this paper the environmental cost was added to the economic accounting system in Baiyinxile Livestock Farm to indicate the real situation of economic development and further study the feasibility of alleviating the pressure of economic development on the environment through the modification of the industrial structure.

Environmental costs are caused by environmental pollution and resource degradation during the production and consumption of commodities. 'The System of Integrated Environmental and Economic Accounting' issued by UNSO in 1993 defined it as: ① the economic loss caused by depletion in amount and decline in quality of natural resources; ② environmental protection cost which includes all expense to avoid environmental pollution or improve environmental quality, and restore the natural resources in amount and quality. Up to now, environmental costs relevant to stockbreeding in XBR are mainly connected the former, or the calculable loss, caused by disasters such as blizzards, sandstorms and locust plagues. This paper calculated the environmental cost based on the loss caused by these disasters.

From the microeconomic perspective, there are three kinds of monetary techniques to evaluate environmental loss and benefit. The first one is the market replacement approach. For example, a blizzard can cause the death of livestock, so part of the environmental loss caused by the blizzard can be evaluated through the market value of these livestock. The second approach is called contingent valuation based on people's willingness to pay. This technique is very suitable for pricing endangered wild flora and fauna. The third one is dose-response technique. For example, ascertaining the relationship between people's health and air pollution at first, then evaluating this influence according to the price on the market or other methods. The first technique was used in this paper. In developing countries, the evaluation of resource degradation and environmental economic loss is still in its elementary stage. Up to now, these techniques are mainly used in loss evaluation of environmental problems such as soil-erosion and deforestation and so on. Although the results based on the existing evaluation techniques are not so perfect, they can still be used to indicate the relative loss caused by environmental degradation (Pearce & Warford 1996).

The time scale of economic analysis in this paper is from June 30, 2000 to June 30, 2001, which is defined as *the grazing year of* 2000. According to the actual income and expenditure, the socially retained profits of the grazing year of 2000 were calculated. The financial and economic analysis was based on prices in 2000.

3.1.2 Macroeconomic analysis of stockbreeding in Baiyinxile Livestock Farm

There are the four livestock farms of Baiyinxile, Maodeng, Beilike and Baiyinkulun and one municipality, Xilinhot city in XBR. Because of the importance and typicality of Baiyinxile Livestock Farm in grazing, it was selected as a case study to analyze the cost and benefit of stockbreeding. Based on the formulation of the socially retained profits mentioned above and after converting the scale of calculation of environmental costs from XBR into Baiyinxile Livestock Farm, the actual economic profit of grazing in Baiyinxile Livestock Farm are analyzed.

Baiyinxile Livestock Farm was set up in 1950 and is one of the biggest farms in China. The pastures are characterized by typical grasslands and meadow grasslands. Baiyinxile has 3,317.47 km^2 of natural pastures* and grazing income accounted for one-third of the total grazing income of XBR and 2.1% of Xilingol League(League equals to City). So the grazing income of XBR was 6.3% of Xilingol League. Since it was difficult to evaluate the environmental cost in the scale of Baiyinxile Livestock Farm, the

* Data from: Development Planning of Baiyinxile Agriculture and Livestock Breeding Joint-stock Company (2001—2010), 2000

total environmental cost of Xilingol City and Xilingol League was evaluated firstly and then converted into Baiyinxile Livestock Farm scale according to the proportions mentioned above. The real income and cost in Baiyinxile Livestock Farm was calculated and shown in Table 3-2.

Table 3-2 The economic analysis of grazing income and cost in Baiyinxile Livestock Farm

Unit: RMB ¥ 10,000

Income	(1) Direct income from livestock production: 3,961.99 (2) Income from livestock deep-processing: 71.50 (3) Tourism income from grazing: 83.20 Total: 4,116.69		
Cost	Productive cost	1,884.80	
	Environmental cost	Loss caused by damages:	Blizzard: 140.18 (livestock death) + 239.02 (input to repair the damage) Sandstorm: 42.33 (wealth insurance) + 8.46 (health lost) + 171 (input to prevent sandstorms) Locust: 80 Sub-Total: 680.99
	Total	2,565.79	
Net Income	1,550.90		

Notes:

(1) The direct income from livestock production: the income from sales of live sheep and cows;

(2) Income from livestock deep-processing: the income from sales of the value-added processing livestock products;

(3) Tourism income from grazing: the income from sales of 'shouba' mutton and dairy products;

(4) Productive costs: the cost to build stables for the livestock and to buy productive materials;

(5) Environmental cost: the cost caused by the environmental pollution and resource degradation during the production and consumption of grazing production. Here only the measurable loss caused by the damages such as blizzard, sandstorm and locust were evaluated, which were considered as a result of the grassland degradation.

Data from: Financial Year Report of Baiyinxile Livestock Farm (1991—2000);

Sum-up of Rescue Work From Last Winter to this Spring of Xilingol League (internal material) 2001

The grazing income structure and cost in Baiyinxile Livestock Farm are shown in Fig. 3-1 and Fig. 3-2 respectively. As shown in Fig. 3-1, the grazing income mainly came from the direct sales of livestock products, which accounted for 96% of total income. Income from value added goods and tourism remained very small, occupying 2% of total income respectively. So it was concluded that Baiyinxile Livestock Farm was at the economic center of the region and is mainly dependent upon the sales of primary products, while the value-added processing industry that could bring more profits was almost zero. In Fig. 3-2, the environmental cost due to disaster damages accounted for 27% of total costs (including blizzards: 15%, sandstorms: 9% and locust plagues:

3%). If there were no environmental costs, then the retained profits from grazing of Baiyinxile Livestock Farm in 2000 were nearly RMB ¥22.3 million. But the actual net income was RMB ¥15.5 million deducting the environmental cost, which was 69% of RMB ¥22.3 million which did not consider the environmental cost.

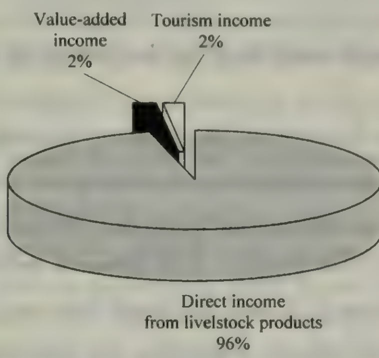


Fig. 3-1 The income structure of Baiyinxile Livestock Farm in the grazing year of 2000

Nowadays, method of evaluating environmental costs are still immature. It was estimated that the environmental cost in developed countries was about 1%—5% of GNP, while in the developing countries it was mostly higher because of a lack of environmental law and special institutions. The evaluations in some developing countries showed environmental costs usually occupied 5% of GNP (Pearce, Warford 1996). However, in Baiyinxile Livestock Farm the environmental cost accounted for 17% of the total income from grazing (680.99 / 4,116.69, as shown in Table 3-2), which was much higher than the average level of 5%. Obviously, the environmental losses have greatly influenced grazing and limited local economic development. Policymakers should rethink from a macroeconomic perspective and find new ways to replace the present simple economic structure to develop the local economy. Only if the grassland resources are recovered and protected during economic development can the residents' health and prosperity be assured to achieve the goal of sustainable development.

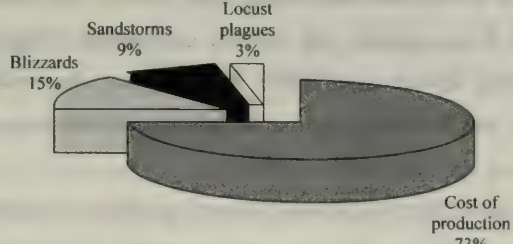


Fig. 3-2 The cost structure of Baiyinxile Livestock Farm in the grazing year of 2000

As mentioned above, this paper only measures one component of environmental

cost, as the immeasurable environmental costs for the loss of biodiversity values and natural resources' existing value was overlooked due to difficulties in measuring them. Therefore, the environmental costs calculated here are only a part of actual lost of environmental value.

3.1.3 Microeconomic financial analysis of herder household's stockbreeding

A household from Sub-farm Seventh in Baiyinxile Livestock Farm was selected as the case site to conduct the microeconomic financial analysis. Baiyinxile Livestock Farm is divided into twelve sub-farms, among which the Seventh Sub-farm covers about 500 km^2 and has 275 households and 1029 people. The Seventh Sub-farm has 84,700 sheep (1 cow or horse is equal to 6 sheep). It was surveyed that over the years the population of herders have continuously increased, especially the floating population. Due to this population pressure, even the waterless grasslands where previously nobody lived are now occupied by herders. They raise livestock by transporting water from nearby water sources.

Among the 275 households of the Seventh Sub-farm, there are over 30 rich households. Each of these households had on average 400 sheep, 300 lambs and 20 cows, which is equivalent to 820 sheep and they earn on average more than RMB¥50, 000 annually. There were 22 households living in poverty. They had no livestock and received about RMB ¥300 monthly by working as casual laborers. Among those in a moderate income were 150 households whose livestock numbered under 100. They could only maintain a subsistence existence and would easily fall into debt once they encountered a bad year or disease.

The productivity of the grasslands is very low due to the drought in 2000. What made it worse was the blizzard in the winter when snow covered the exiguous and scattered grass. The herders were unable to graze the livestock in winter at all and therefore confined them to the pen for about half a year. In 2000, 70% of the fodder purchased was sourced from outside the area to complement the shortages in this sub-farm. Hay for just one sheep cost RMB ¥0. 70 per day and totally RMB ¥130 throughout the winter, which forced most herders to spend most of their hard earned savings.

One household selected for this study consisted of seven members. The family had 80 hm^2 of cutting pastures, 293 hm^2 of grazing pastures, 500 sheep and 11 cows. Their economic condition is above average within the sub-farm. The householder informed us that they could harvest 100,000 kg grass before 1998 and earned money from selling the grass. During 1996-1998 the number of sheep reached its peak of 860 due to the

favorable weather condition. However the quality of the grass degenerated greatly during these years. Compared with 1984, the grass production in 1996 had decreased by 50%. The household had 440 sheep when entering the winter of 2000, but only 380 sheep were left after the winter. The loss of 60 sheep included those which had died during a blizzard as well as some natural deaths, especially during the Nov. 31, 2000 to Jan. 1, 2001 snowstorm when over 30 sheep and two cows died. Table 3-3 shows the financial analysis for the household's stockbreeding in the grazing year of 2000.

Table 3-3 The financial analysis of a household's stockbreeding in XBR Unit: RMB ¥

Income	Sale of livestock: 40,000
Cost	Expenditure on fodder: RMB ¥7,400 (including a carriage fee of RMB ¥1,700) Employee costs for grass-cutting: RMB ¥5,600 (including a carriage fee of 2000) Grassland fee (paid to the sub-farm): RMB ¥504 Tax (paid to the local government every July): RMB ¥10,840 Disaster losses: RMB ¥8,850 Total: RMB ¥33,194
Net income	RMB ¥6,806
Income per capita	RMB ¥972

As shown in Table 3-3, the household earned a net income of RMB ¥6,806 from stockbreeding in the grazing year of 2000 according to our financial analysis, and the income per capita was RMB ¥972 (RMB ¥6,806 / 7 persons). Besides essential living expenditure, they had to shoulder the costs of education, tuition and living which totaled about RMB ¥10,000 annually for their children. This meant that the household had to use their savings in order to sustain their level of production and living. As shown in Fig. 3-3, disaster losses accounted for 27% of total costs, which reflected the great influence of disasters caused by the grassland degeneration to the herder's economic income. The expenditure on fodder was also caused by the environmental degeneration, which was 22%. The total cost associated with grassland degeneration was thus 49% including the above two parts. The following two conclusions could be obtained based on this financial analysis: (1) The degradation of Xilingol grasslands has led to a loss of income for herders. If the productivity of the grasslands cannot be recovered and the disasters reoccur, then stockbreeding and the herders' livelihoods will end. (2) Under the present situation, stockbreeding in XBR is mainly dependent on natural conditions and a simple industrial structure. It is therefore highly vulnerable in the long-term and there cannot be any guarantees of income for herders.

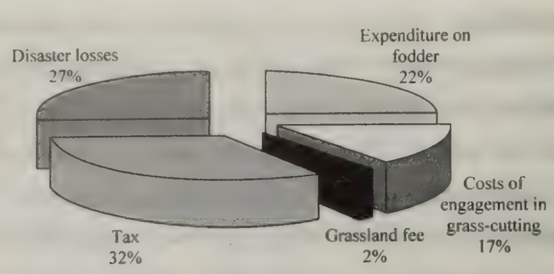


Fig. 3-3 The herder's expenditure structure in the grazing year of 2000

3.2 Benefit Distribution Analysis of Stockbreeding for Stakeholders

The relevant stakeholders involved in stockbreeding in Baiyinxile Livestock Farm include the local government, the farms, herders and the transporters who transport the fodder from other places to Baiyinxile Livestock Farm in winter. As shown in Table 3-2, the socially retained profit from grazing within Baiyinxile Livestock Farm in the grazing year of 2000 was RMB ￥15,509,000. The benefit distributions for different stakeholders were as follows, and the details of this calculation are shown in Box 3-1:

(1) Local government revenue: RMB ￥2,693,000;

(2) Ranch: livestock epidemic prevention fee, managing fee and grassland fee collection RMB ￥6,629,000; net income from collective livestock sales RMB ￥246,000;

(3) Herders: net income from personal livestock sales RMB ￥1,454,000; income from working as casual labor: RMB ￥2,220,000.

(4) Transporters: RMB ￥2,267,000.

As shown in Fig. 3-4, Baiyinxile Livestock Farm as the biggest beneficiary received 44% of the total net income. The second recipient was the local government accounting for 17%. The income distributed to herders occupied 24%, and the income per capita was RMB ￥359.8 (3,674,000 / 10,210, excluding the income from transportation since some of the transporters were not local herders).

If the number of livestock reduced to protect the grasslands, then the income from livestock breeding would decrease in the short term. However, different stakeholders would suffer different losses based on the above analysis. The different influences on all the stakeholders due to the grazing compression were analyzed as below.

(1) National and local finance: local financial income of Xilinhot City was RMB ￥167,660,000. Because the grazing income of Baiyinxile was one-third of XBR, the contribution of the grazing benefit in XBR to the Xilinhot finance is 5% (2,693,000×3)/ 167,660,000). So the reduction of livestock breeding would only have a small impact on the local financial income. However from the point of view of the livestock

breeding strategy, there were two impacts on the local economy:

① It was estimated that beef production in Xilingol League accounted for 30% of the total amount in Inner Mongolia; mutton production accounted for 31.3% of Inner Mongolia and 2.7% of the whole country; and cashmere production accounted for 20.7% of Inner Mongolia and 7.6% of China. The production of more than ten items, such as beef, mutton, cow hide, sheep skin, wool, cashmere and so on, came first on the list of Inner Mongolia statistical year book (Aoribu, 1997). Therefore, a reduction in stockbreeding would greatly impact the livestock market and production in Inner Mongolia as well as the whole country, for example, the price of livestock products would rise, some speculators would come forth in the market and so on.

② A decrease in the number of livestock would directly influence the value-added processing of livestock products. If the multiplier effect was considered, the impact on the local financial income would exceed the original 5%. Meanwhile, the concomitant problems of unemployment would emerge, which would affect social stability.

(2) Baiyinxile Livestock Farm: According to the financial report of Baiyinxile Livestock Farm in 2000, its GNP was RMB ¥60,500,000, among which the income from stockbreeding was RMB ¥27,360,000 and accounted for 45% of GNP. Therefore stockbreeding was vital to Baiyinxile Livestock Farm and its reduction would have a large impact upon the income of Baiyinxile Livestock Farm.

(3) Herders: the income from stockbreeding was almost the only source for most herders. A reduction of livestock would cause a direct decrease in the herders' income. So if the herders had no other source of income to replace or partly replace stockbreeding, then the target of protecting the grasslands through reducing stockbreeding would be impossible to achieve.

(4) Transporters: Even if the number of livestock was decreased, the fodder for winter would still be required. So a decrease in livestock numbers would result in little influence for these transporters.

From the above analysis, it was concluded that if stockbreeding was reduced, it would be the herders who suffer the greatest economic losses, especially those wholly dependent on stockbreeding. The second group would be Baiyinxile Livestock Farm who would be severely influenced. For the whole of XBR, a reduction in stockbreeding would not only impact upon local economic development but also social stability. If there were no suitable policies, it would heavily influence the farm. Local policymakers should issue a set of practical policies to ensure the stabilization of the market.

However, a radical resolution to all of these problems depends on the modification of the industrial structure. On the one hand, value-added processing technology of livestock products should be developed. On the other hand, other environmental friendly industries, such as ecotourism should be developed. Only suitable financially

viable industries can be developed to compensate the economic losses caused by a reduction in stockbreeding so as to achieve the goal of grassland protection and economic development.

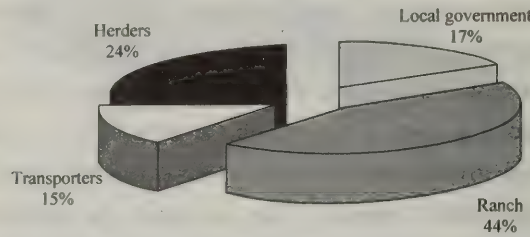


Fig. 3-4 The benefit distribution of stakeholders in Baiyinxile Livestock Farm in the grazing year of 2000

Box 3-1 The benefit distribution calculation in Baiyinxile Livestock Farm

In the grazing year of 2000 Baiyinxile Livestock Farm sold 10,133 cows and 166,023 sheep, which is equal to 226,821 sheep (one cow = 6 sheep), among which there were 2,318 collective cows and 25,206 collective sheep, which is equal to 39,114 sheep. So collective livestock accounted for 17% of the total sold livestock. By the end of 2000 there were 4,464 cows and 206,880 sheep on hand, equal to 233,664 sheep. *

1. Local government: tax was levied at RMB ¥20 / cow and RMB ¥15 / sheep, so the total was

$$20 \times 10,133 + 15 \times 166,023 = \text{RMB ¥}2,693,000$$

2. Livestock epidemic prevention fee and managing fee: the fee was collected according to RMB ¥40 / cow and RMB ¥35 / sheep, so the total fee was

$$40 \times 10,133 + 35 \times 166,023 = \text{RMB ¥}6,216,000$$

3. Grassland fee: the grassland fee was paid according to RMB ¥1.35 / hectare, there were 305,833 hectare of grassland in Baiyinxile Livestock Farm, so the total grassland fee was

$$1.35 \times 305,833 = \text{RMB ¥}413,000$$

4. Transportation expenditure: the transportation expenditure per sheep unit was RMB ¥9.7, so the carriage was

$$9.7 \times (4,464 \times 6^{**} + 206,880) = \text{RMB ¥}2,267,000$$

5. Income from working as casual laborer: here the casual laborer was mainly referred to as those employed to cut grass for other herders. If it was estimated in sheep unit, the cutting-grass fee per sheep unit is RMB ¥9.5. So the total income was

$$\text{RMB ¥}9.5 \times (4,464 \times 6 + 206,880) = \text{RMB ¥}2,220,000$$

6. Grazing income: After subtracting the above cost from the total socially retained profit, the net grazing income was RMB ¥1,700,000, which is calculated below:

* Data from: Financial Year Report of Baiyinxile Ranch(1991—2000)

** 1 cow=6 sheep units

Continued Box

RMB ¥15,509,000 − RMB ¥2,693,000 − RMB ¥6,216,000 − RMB ¥413,000 − RMB ¥2,267,000 − RMB ¥2,220,000 = RMB ¥1,700,000

According to the contract between Baiyinxile Livestock Farm and the herders, Baiyinxile had the right to receive 85% of the total income from collective livestock(Rik Thwaites, 1998):

RMB ¥1,700,000 × 17% × 85% = RMB ¥246,000

So herders receive: RMB ¥1,700,000 − RMB ¥246,000 = RMB ¥1,454,000

The income per capita was: (RMB ¥1,454,000 + RMB ¥2,220,000) / 10,210 persons = RMB ¥359.8

3.3 Economic Reasons for Grassland Degradation

Before the economic reasons of grassland degradation are identified, it is necessary to first introduce the fragility of Xilingol's grassland ecosystem. Xilingol's grassland is the main distribution area of China's temperate and semi-arid typical grasslands. The annual precipitation is 350 mm, and the soil is mainly sand-soil. Due to global climate changes and the long-term excessive and irrational utilization of the area by humans, the degraded grasslands now account for 81.7% of the total area. This once stable grassland ecosystem has encountered the possibility of desertification. If Xilingol's pastures continue to degrade, the pasture ecosystem in Xilingol is destined to collapse. This is an unacceptable situation for the current inhabitants.

Based on our survey and analysis, three main economic reasons were considered to lead to grassland degradation:

(1) Excessive agricultural reclamation due to historical reasons. From an ecological point of view, the agricultural zone should be distributed in the area with annual precipitation over 400 mm. In Xilingol the annual precipitation is only 350 mm, so it is unsuitable for agriculture. However, agriculture has been developed since the 1950's. It was believed that there were two reasons for developing agriculture in the region: firstly, a shortage of food and the underdevelopment of the market, so food and vegetables for residents must be self-supplied; the other was the 1960's campaign of 'The whole people should devote themselves to agriculture to strive for food self-sufficiency'. Reclaimed fields in Xilingol have increased greatly from 6 hm^2 in 1953 to 22,167 hm^2 *. This development accompanied by a lack in precipitation has resulted in desertification.

(2) The traditional life and production style maintained a relatively simple

* Data from: Xilinhot Chorography (1999)

production cycle, namely grazing. All the population living in the pasture has relied upon the grassland resources, which led to the excessive utilization of the grasslands. Since the natural pastures account for 90% of the total area in Xilingol, the abundant grass resource have entrenched a belief by herders that the grassland resources are limitless. With this background, the local economy was developed only through increasing livestock numbers, while the quality and value-added industries were neglected.

(3) An inefficient distribution of resources led to the excessive use of the natural resources. Prior to 1949, the local economy was private. After socialization in 1956, the grassland and livestock were claimed to belong to the collective. Since the introduction of the 'Household Production Responsibility System' in 1979, the grasslands were distributed to the herders, but the grasslands ownership rights still belong to the collective. The herders pay a grassland fee to the livestock farm (standing for the collective) for use of the grasslands. The above financial analysis revealed that although the degradation of the grasslands has increased the cost of herder's stockbreeding, it was only part of the total environmental cost. Because the property of the grassland was owned by the collective, the cost for recovering the degraded grassland (such as the expenditure to control sandstorms and locust plagues) was not paid by the herders but instead by the nation. Therefore the social cost of stockbreeding was more than the private cost, which produced an externality. Compared with the Pareto Optimum of social resource distribution, such property rights structure would result in some deviations, as shown in Fig. 3-5. In Fig. 3-5, the X-axis represents the quantity of livestock production (Q), and the Y-axis represents the price of livestock products (P) and marginal cost (MC) and benefit (MB). Due to the presence of an uneconomical externality, the marginal social cost (MSC) was more than the marginal private cost (MPC). The marginal benefit (MB) was the income from sale of one more unit of livestock unit. The margin was the external environmental cost (the cost spent in controlling desertification and locust plagues of one more unit degraded grassland). When MC equals to MB, the optimal benefit is achieved. In Fig. 3-5, the herders' optimal quantity of livestock products was Q1, which was the X value of intersection point of MB and MPC, and the corresponding optimal price was P1. The social optimal quantity of livestock products was Q, which was the X value of the intersection point of MB and MSC, and the corresponding optimal price was P. It is obvious that the number of livestock (Q1) when herders achieve an optimum exceeded the social optimum (Q). The grassland resources are over-utilized; the price of livestock products is lower than the optimal price. The herders have no incentive to control the number of livestock within the grassland carrying capacity. Moreover, there was no managing regulation and collective decision-making organization to limit the number of livestock and protect the

grassland from over-use. It showed that this inefficient structure of property rights had brought many negative effects.

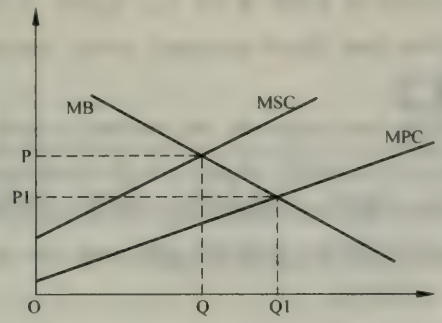


Fig. 3-5 Over-use of natural resources due to the difference between the marginal social cost and the marginal private cost

3.4 Conclusions and Suggestions

3.4.1 Conclusions

Based on the above analysis of stockbreeding in Baiyinxile Livestock Farm, the following conclusions could be obtained:

(1) From an economic perspective, the environmental cost of grazing in Baiyinxile Livestock Farm accounted for 17% of total income, which was over three times the average level throughout the world (5%). The damage to the environment in XBR was very severe.

(2) Environmental degradation had severely restricted grazing development in XBR. If environmental cost were included in the retained profit calculation of grazing, the real income of Baiyinxile Liverstock Farm in the grazing year of 2000 would decrease by almost one-third. From the financial analysis for the individual household, it revealed that the economic losses due to environmental degradation accounted for almost half of total expenditure.

(3) The ongoing drought during the past three years (1999—2001) had resulted in the spending of herders' savings. If the environment could not be recovered and the natural disasters continued, then there would be few options available for the herders.

(4) With a background of stockbreeding on the grasslands mainly relying on favorable natural conditions, grazing would continue to remain very vulnerable. The present simple industrial structure should be changed according to local conditions. New options need to be considered for developing the economy, for example the development of eco-tourism.

(5) According to the analysis of benefit distribution, the retained profit of society per capita was RMB ¥359.8 (as shown in the Box 3-1), which was RMB ¥612 lower than the individual net income of RMB ¥972 (as shown in Table 3-3). Though the herder's economic condition was above average, many externalities remained in the business of stockbreeding.

(6) If livestock breeding was reduced, the herders would mostly suffer from any economic losses, especially those wholly dependent on stockbreeding. Only if financially suitable industries are developed to compensate such economic losses caused by a reduction in stockbreeding, shall the goal of protecting the grasslands and promoting economic development be achieved.

3.4.2 Suggestions

Based on the above analysis and conclusions, the following suggestions are supplied:

(1) Decrease the number of livestock appropriate to the grassland's carrying capacity.

(2) Increase the proportion of livestock raised in the pen.

(3) Develop value-added livestock products so as to increase the value of these products.

(4) Extend the existing simple industrial structure of grazing to a more complex one, and thus alleviate the pressure on the natural grasslands.

CHAPTER 4

ECOTOURISM AND GRASSLAND RESTORATION IN XILINGOL BIOSPHERE RESERVE

In this chapter, the maximum recreational benefit of Xilingol Biosphere Reserve (XBR) was evaluated using the Travel Cost Method (TCM). Based on this evaluation, the feasibility of developing tourism and alleviating the current problem of over-grazing was analyzed from an economic viewpoint. It is argued that the benefits attributed to local community participation in tourism are an effective guarantee of alleviating the over-grazing of the grasslands. In order to offer some practical suggestions regarding community participation, some instances where local herders are involved in tourism operations have been included. Finally, the existing problems of ecotourism management were analyzed and suggestions made for improving the management of the administration of XBR.

4.1 The Economic Feasibility of Developing Ecotourism in Alleviating Over-grazing in XBR

As analyzed in the last chapter, the existing stockbreeding practices have resulted in a high degree of pressure on XBR's grasslands and blocked the further development of the local economy. Therefore it is necessary to modify the present industrial structure which mainly depends on the stockbreeding. XBR is endowed with a beautiful natural landscape and an attractive ethnic minority culture, therefore ecotourism should be a good choice to partly replace stockbreeding and thus alleviate the over-grazing. Nevertheless, there are still some questions that remain unresolved about the real economic potentials of ecotourism in XBR, such as how much economic benefit it would bring, and to what extent it could substitute the current stocking. In order to offer a quantitative answer, the TCM model was applied to estimate the maximum recreation benefit of XBR.

4.1.1 Tourism attractions in XBR

Xilingol grassland nature reserve was founded in 1985, and was accepted into the UNESCO/MAB network of international biosphere reserves in 1987. It was the first typical and representative grassland nature reserve established in China. It possesses a natural superiority in developing ecotourism.

The ethnic Mongolian people who originally inhabited the grasslands have a long history and profound cultural and spiritual relationship with the grasslands. Both their life style which reflects their special social economic and natural circumstances and their honest manners in hosting people are well proven to be strong attractions for outside tourists.

A rich scientific history is another characteristic for the tourist resources of XBR. A long-term grassland ecosystem research station was established by the Chinese Academy of Sciences in 1979. During the past two decades, dozens of Chinese and foreign scientists including botanists, zoologists, agriculturalists, ecologists and microbiologists annually visit the center to undertake scientific research on the grassland ecosystem. A great deal of research data has been accumulated and substantial research achievements have been made during this period. It is currently the sole research base in China for carrying out long-term, coordinated and systematic research on the temperate zone grassland ecosystem. There are many basic facilities found at the research station such as sampling sites, an experimental forestry center, a scientific research monitoring center, a specimen room, an exhibit hall and laboratories. All of these facilities have been opened to tourists as a window of introducing this outstanding grassland ecosystem. A little different from other tourist sights on the grasslands, the XBR is indebted to the station for the ongoing strong supports from scientific research to popularize scientific and public education, which are key components of a successful ecotourism strategy.

Another superiority of the grasslands is the location of Xilinhot City in the center of XBR, so that the transportation and communication facilities of Xilinhot could be used to further develop tourism. Xilinhot City has been listed by the State Development Planning Commission and the National Tourism Bureau as one of 70 preferential cities in China's west to receive support for developing tourism. Furthermore, XBR is considered as one of the five famous tourist destinations in the Inner Mongolia Autonomous Region (IMAR). Therefore, XBR has much potential to develop tourism.

4.1.2 Feasibility analysis of alleviating over-grazing through tourism in XBR

4.1.2.1 Travel cost method

Based on the classical TCM model (McKean et al. 1996; Hanley 1989; Strong 1983) and the samples from questionnaire surveys, the travel demand curve of XBR was obtained, according to which the maximum potential economic benefit was then evaluated. The detailed methodology is described in Box 4-1.

4.1.2.2 Recreation benefit evaluation

As shown in Box 4-1, the maximum travel benefit could be evaluated through the following equation:

$$R = POP \times [68.734 - 9.062 \times LN(TC)] \times TC$$

Supposing the number of tourists living in an area *POP* was constant, it could be found that the travel benefit *R* reached its maximum when travel cost *TC* was equal to RMB ￥724 per person. The maximum travel benefit in a different future period could thus be obtained when the different *POP* value (State Statistic Administration 2000) was predicted in the corresponding period, as shown in Table 4-1.

Table 4-1 Maximum predicted benefit of tourism in XBR

Years	Number of tourists in source areas (*POP*)/billion	Maximum travel cost of out-of-town tourists (*TC*1)/ billion Yuan	Local benefit from out-of-town tourists (*TC*11)/billion	Benefit from local tourists (*TC*2)/billion	Total (*TC*11+*TC*2) /billion
2000	1.27	1.08	0.52	0.11	0.63
2005	1.32	1.20	0.58	0.12	0.68
2010	1.38	1.32	0.63	0.14	0.77
2015	1.42	1.43	0.68	0.15	0.83
2020	1.47	1.53	0.73	0.16	0.89

In Table 4-1, the maximum cost of out-of-town tourists *TC*1 (Box 3) actually contained two components: spending within the XBR (*TC*11) which was listed in Box 4, and the cost of traffic and accommodation during the journey from the place of commencement to XBR which should be excluded from the total benefit when we only considered the tourism benefit to the area within XBR. The values in Box 4 were obtained according to the ratio *TC*11/*TC*1 of 47.8% that was estimated based on the sample data. Likewise, based on the analysis of sample data it could be found that the travel cost of local tourists *TC*2 accounted for 22.5% of the out-of-town tourists (*TC*1), thus the recreational benefit from the local tourists in different years was obtained, as shown in Box 5. The total maximum travel benefit for the local area within XBR in different years was the sum of *TC*11 and *TC*2, as shown in Box 6 of Table 4-1.

Box 4-1 Using TCM to evaluate the maximum recreation benefit in XBR

Methodology

Based on the classical ZTCM (Zonal Travel Cost Method) which is one kind of TCM (Willis and Garrod, 1991; Liston-Heyes and Heyes, 1999), tourists were categorized into different zones according to their starting place. For each zone, a multiple regression was established with the travel rate (*TRATE*) as a dependent variable and the average travel cost (*TC*), age (X_1), income (X_2), education (X_3) and others (X_n) as independent variables. Removing these insignificant independent variables, the tour demand function within the study area could be obtained, as shown in Equation (1). The shape of the curve depends on the relationship between the travel rate $TRATE_i$ and the zonal travel cost TC_i, while the position of the curve in the reference frame depends on those exogenous variables X_i.

$$TRATE_i = f(TC_i, X_1, X_2, \cdots, X_i, \cdots, X_n) \tag{1}$$

Where,

$TRATE_i$——Travel rate, $TRATE_i = V_i / P_i$;

V_i—— Total number of tourists from zone i during a certain period;

P_i—— Population in zone i;

TC_i—— Average travel cost from zone i to the tourist destination;

X_i—— social and economic variables of tourists from zone i.

Once the statistical values of those exogenous variables of tourists from a certain zone were obtained through prediction, for example, the tourists' average age, level of education, and income in 10 or 20 years time, then the travel demand curve of that zone in the coordinate system could be drawn. At the point in this curve where the product of the *X*-coordinate and *Y*-coordinate reach a maximum, the corresponding value of the *X* coordinate (TC_i) is the average cost in zone i if the maximum economic benefit (R_i) would be reached in the future, while the *Y* coordinate value ($TRATE_i$) is the average travel rate when it is obtained. If the future population in zone i is predicted, the largest recreational benefit from that zone in a future certain year could be evaluated, as shown in Equation (2). The maximum travel benefit from all the zones (*R*) is evaluated through summing R_i, as shown in the Equation (3).

$$R_i = TRATE_i \times TC_i \times POP_i \tag{2}$$

$$R = \sum R_i = \sum ARR_i \times TC_i \times POP_i \quad (i = 1,2,3\cdots) \tag{3}$$

Through an analysis of the sample data, it is assumed that the travel demand curves in different zones would be the same, or in other words, for all the exogenous variables the differences between the different zones could be ignored. Therefore, Equation (3) could be simplified to equation (4).

$$R = ARR \times TC \times POP \tag{4}$$

Where *TRATE* and *TC* are the travel rate and the travel cost of any point on the travel demand curve respectively, and *POP* is the total population of all the zones which tourists come from. The maximum of *R* in the equation (4) would be the maximum value of recreational benefits.

Continued Box

Questionnaire Survey

In order to construct the above demand curve, it was necessary to collect sample data using the questionnaire survey method at various tourist destinations. In this study, the questionnaire survey was conducted during July-August 2001 in XBR. The pre-survey results showed that tourists in XBR could be split into two categories, local tourists (living in Xilinhot City) and out-of-town tourists, and the proportion of local to out-of-town tourists was 2 : 1. Since there was a great difference both in their consumptive costs and behavior, they would be considered in different ways in the evaluation of travel benefits. For the local tourists, the components of travel cost were comparatively simple and contain the expenditure on transport, accommodation and entertainment at the tourist resorts. The cost of every local tourist was not very large, ranging from RMB ¥75 to RMB ¥80, and the difference between individuals was also insignificant. In the following calculations, the local individual cost was thus assigned as RMB ¥75 per person. For the out-of-town tourists, the travel cost was much higher than the local tourists, which included expenditure on transportation and accommodation during the round trip from their starting place to Xilinhot City. Through the pre-survey results, it was also known that although the number of out-of-town tourists was less than the local tourists, the recreational benefit from out-of-town tourists was much more than the benefit from local tourists. Considering the developing potential of out-of-town tourists, they would be taken as the key research objective. Therefore the questionnaire was designed based on the out-of-town tourists. A total of 115 questionnaires were collected, among which 89 responses were available.

Modeling

Following the procedure of ZTCM, the out-of-town tourists were categorized into 10 zones according to their starting places. The significance analysis, utilizing the statistical software package SPSS, revealed that the regression model with a TC in logarithmic form offered the most perfect formulation. The result of regression is shown in Equation (5).

$$TRATE = 119.11 - 13.99LN\ (TC) + 1.72\ SATI + 3.75 \times 10^{-3}\ INCO + 0.26\ EDU - 0.79\ AGE \tag{5}$$

Where $LN(TC)$ was the log form of TC, $SATI$ was the variable describing the satisfactory degree of tourists, $INCO$ was the tourist's monthly income, EDU reflected the tourist's education, and AGE was the age of a tourist.

The regression was insignificant since its P-value of F-test was 0.409, and the result of a t-test for each variable was also insignificant. However, if the regression is tried with $LN(TC)$ as a sole independent variable, the result would be more satisfactory, as shown in Equation (6).

$$TRATE = 68.734 - 9.062 \times LN(TC) \tag{6}$$

In this regression, the correlation index R-Square equal to 0.365 and a P-value of t-test was 0.064. Though 0.064 was still a little greater than 0.05, the regression model was considered acceptable due to the small sample size.

Combining Equation (4) with Equation (6), the maximum travel benefit in XBR could be evaluated from Equation (7).

$$R = POP \times [68.734 - 9.062 \times LN(TC)] \times TC \tag{7}$$

What had to be explained here was that the calculation of the above maximum recreational benefit was entirely dependent on the quantitative relationship between the price of goods and consumption amount in economics, so some differences existed between the practical value and the calculated result. In fact, there were three hypotheses in our research. Firstly, that the existing tourist source zones would not vary with time in the future, or in other words, the possibility that tourists might come from new zones was neglected. Secondly, that any new independent variables appearing in the future would be ignored. And thirdly, that the increasing rate of population in all the tourist source zones was the same. Due to these hypotheses, the predicted value would unavoidably contain some bias compared with the practical value. Anyway, the research shows that all these hypotheses would result in an underestimated value. If this underestimated value could satisfy the request of stockbreeding substitution, it would be feasible to develop ecotourism for alleviating the existing regime of over-grazing.

4.1.2.3 Economic feasibility of alleviating over-grazing through developing ecotourism

In order to present the proportion of each industry within the whole economy, the GDP structure within XBR in 1998 was analyzed*. The GDP in 1998 was RMB ¥1.87 billion, of which primary industries accounted for RMB ¥0.207 billion (mostly from stockbreeding); secondary industries contributed RMB ¥1.203 billion; while tertiary industries (including tourism) added RMB ¥0.460 billion. This structure is illustrated in Fig. 4-1. As shown in Fig. 4-1, the greatest contribution to GDP came from secondary industries which accounted for 81% of the total value, whlie stockbreeding accounted for only 14%, while tourism was less than 5%. The GDP in 2000 was about RMB ¥2.0 billion, if the percent of the contribution from secondary industries to GDP remained constant with 1998 (i. e. 81% of the GDP) and all the stockbreeding was substituted by tourism industry, the production value of tourism should be RMB ¥0.38 billion at least (19%×2.0). Comparing this request with the predicted value of tourism production in 2000 (as shown in the Table 4-1), it could be concluded that tourism has the potential to achieve this expected potential. Certainly, it is impossible to completely substitute ecotourism for stockbreeding, and in fact it is also unnecessary. From an ecological viewpoint, some livestock are necessary for the natural grasslands to maintain biodiversity and a dynamic ecosystem.

From the tourism statistical data of Xilinhot city, it was found that the practical revenue from tourism within XBR in 2000 was RMB ¥70.83 million, While the theoretical maximum production value estimated above was RMB ¥0.63 billion. Obviously a big gap existed between the practical and theoretical values, which might be

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* Here the GDP actually is the value of Xilinhot. Since the administrative boundary of Xilinhot is almost the same as XBR, the differences could be neglected.

caused by the following two reasons. Firstly, poor tourism operations and management resulted in a less practical value than the theoretical value, and this meant there is still great potential to develop tourism through a scientific management policy in XBR. Secondly, it was possible that a great deal of the benefits from tourism were taken away by the tourism practitioners who are largely based on outside XBR. This would reduce the ability of XBR to alleviate over-grazing through tourism, particularly when the local herders were not involved in and received little benefit from tourism. Community participation will be analyzed in the following section.

Of course, the over-development of tourism should be avoided, since it could also lead to environmental degradation similar to over-grazing. This means that environmental costs exist in developing tourism. However this kind of cost could be avoided or reduced through the practice of scientific tourism planning and strict management, particularly in the initial stages of tourism development. Therefore ecotourism planning, guidelines and a strict management policy are necessary for future work.

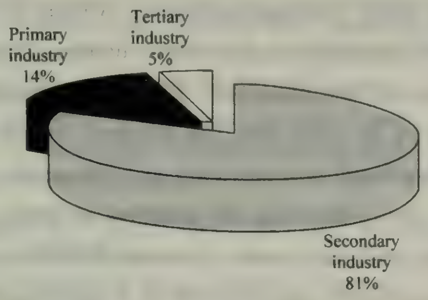

Fig. 4-1 Structure of GDP within XBR in 1998

4.2 Community Participation in Ecotourism in XBR

There is no question that ecotourism represents one of the most environmental friendly alternatives for the indirect use of natural resources in comparison with stockbreeding which directly utilizes the grasslands. As discussed above, there are rich tourism resources in XBR, and from an economic viewpoint it should be possible to alleviate over-grazing through the development of tourism. However, only when the local people receive enough economic benefits from ecotourism, would they reduce their livestock according to a more sustainable carrying capacity for the grasslands and thus ensuring the proper protection of the grasslands. Therefore, it is important to know how to involve the local community in tourism and to ensure the economic benefits would be a key aspect in restoring the degraded grasslands through developing tourism.

The state of community participation in ecotourism will be analyzed based on a

practical survey. Through the analysis of some case studies, the existing problems are presented and relevant suggestions provided.

4.2.1 Community participation and its necessity

The concept of "community participation" has already been used quite extensively. In the sociology field, it refers to community residents participating in the management and decision-making affairs which are relevant to the community itself (Liu 2000; Peterson et al. 1999; Wang and Wang 1998). In this paper, it refers to the majority of residents in XBR participating in ecotourism and obtaining benefits from this participation. Its ultimate goal is to protect XBR's grassland resources and improve the living conditions of residents to ensure that XBR develops in a sustainable way.

Considering the current severe situation of grassland degradation within XBR, it is especially essential for the local community to participate in ecotourism and receive economic benefits. Herders are the hosts of the meadows and all of them hope that the previous healthy situation shall once again return. Almost all the herders rely only on stockbreeding, so it would inevitably reduce their income if the number of livestock was required to be reduced (see the last chapter). Therefore, in order to ensure this policy is accessible it is necessary to be sure that the herders would receive enough economic benefits from other substitutional sources such as ecotourism, which should be no less than the economic losses due to limiting the quantity of livestock.

Because of the natural and man-made disasters in recent years, the local herders' income has decreased dramatically and resulted in a significant reduction in their living conditions. According to the analysis in the previous chapter, a family's net income in 2000 has threatened the survival of some herders. Community participation in ecotourism would offer an alternative option for local residents to obtain a living income, and help them to gradually finish their days only dependent on nature.

Conforming to the State's relevant policies, Xilingol's grasslands have been divided up and distributed to each household according to the number of family members, so that herders have the right to utilize the grasslands. Therefore from a land-use rights perspective, tourism would not be developed if the local herders who possessed the land-use rights to the grasslands were not directly involved.

4.2.2 Status of the tourism industry in XBR

Based on our survey, the tourism industry in XBR could be divided into 6 types according to ownership, as shown in Table 4-2.

Considering the extent of the local herders' participation, the first three types

(owned and managed by private operators from outside of XBR, owned by collective interests and managed by private operators under contract, and owned and managed by collective interests) have nothing to do with community participation, which has mostly developed by some state-owned tertiary-industry companies. However these tourist enterprises accounted for most of the business in XBR (we shall refer to these as non-herding managers). The scale of tourist enterprises operated by unemployed workers was too small to be analyzed in this article. The last two types in Table 4-2 present the current status of local herders participating in tourism businesses, with only a few herders individually operating tourism businesses (individual herder managers) and only one tourist resort jointly owned and operated by herders (joint herding managers). Community participation in tourism is still in its initial stage.

Table 4-2 Different types of tourism enterprises in XBR

Types	Tourist resorts surveyed	Scale
Owned and managed by private interests from outside of XBR	Xiritala	70 Mongolian-style yurts for guests
Owned by collective interests and managed by private operators under contract	Zakstai Lake(owned by XBR management bureau) Baiyinxile center for tourism service (owned by Baiyinxile Livestock Farm) Chengjisihan Tent(owned by the local tourism bureau) Gegenaobao(owned by the Lüda Company)	9 Mongolian-style yurts 8 Mongolian-style yurts 5 Mongolian-style yurts 19 Mongolian-style yurts
Solely owned and managed by collective interests	Dianchang Village(owned by the local electricity power plant)	7 Mongolian-style yurts
Owned and managed by local unemployed workers from Xilinhot City	Baiyingaole tourist resort	4 Mongolian-style yurts
Individually owned and operated by local herders	Nuoerbu Baoyu	6 Mongolian-style yurts 15 Mongolian-style yurts
Jointly owned and managed by local herders	Aoqi village	16 Mongolian-style yurts

4.2.3 Case study and analysis

As illustrated above, according to the extent of local herder participation in tourism enterprises in XBR, tourism enterprises could be categorized into three types: Non-herding managers, Individual herding managers and Joint herding managers. Based on our survey of these cases, the characteristics, advantages and disadvantages of these

three types are analyzed as follows.

4.2.3.1 Non-herding managers

At present the non-herder managed tourist resorts constitute the majority of tourist managers in XBR. Most of whom come from tertiary industries originally owned by the local government or state enterprise. For some of these companies, the management authority has been transferred to some employees in their own company; while for other companies, the property rights have been contracted to individuals such as at Xiritala tourist resort.

It is necessary to first analyze the relationship between these non-herder operated tourist resorts and the level of local community participation. For this purpose, Gegenaobao tourist resort, a large scale tourist resort, was selected as a case study. This tourist resort was built in 1995 by the local finance bureau, transport bureau and electricity bureau for a total of RMB ¥4,000,000. Now its property rights are owned by the finance bureau and run by the Lüda Company. It contains 16 Mongolia-style yurts which can accommodate more than 100 people and serve meals or drinks to more than 300 people.

The investment, income and quantity of tourists are shown in Table 4-3. As shown in Table 4-3, such a large scale tourist resort requires a significant amount of accumulative investment for infrastructure maintenance and daily operation, which is impossible for most local herders to intiate.

Table 4-3 The status of Gegenaobao tourist resort

	Accumulative total investment /10^4 RMB ¥	Revenue /10^4 RMB ¥	Tax /10^4 RMB ¥	Quantity of tourists
1997	916	640	32	13,924
1998	1,236	870	43	20,179
1999	1,436	940	47	14,832
2000	1,650	700	35	12,000

There are more than 20 employees working in this tourist resort, and of whom are hired from the labor market in Xilinhot City. Only three are from local herding families. When we asked why they did not employ more local herders, the manager explained that the local herders were difficult to manage, they tended to not follow the rules and liked to return back home too frequently.

There were more than 700 cooked sheep sold to tourists in 2000 at this resort. However these sheep were not from the local livestock farms, but from the surrounding pastures. Also most of the dairy products for the tourism enterprises were sourced from local herding households.

Based on the above analysis, it could be concluded that most of the revenue from tourism was extracted by the owners (Lüda company) which are based outside of Xilingol Biosphere Reserve. Although they pay tax (about RMB ¥30,000 ~ RMB ¥40,000 per year) to the local government. Beyond this the tourist enterprise contributed very little to the local community, other than in absorbing local labor and increasing the herders revenue from stockbreeding sales. Therefore this kind of tourism business does not fundamentally alleviate the existing over-grazing in XBR.

4.2.3.2 Individual herder managers

In order to analyze the current situation of individual herder managed tourism enterprises, two herder households were surveyed and interviewed. The purpose of our interview was to discover the possibility of adopting this style of tourism enterprise as one of the ways to partly substitute stockbreeding. Three aspects of information needed to be obtained from the interview: conflict over resource competition between tourism managers and herders (e. g. time, investment, labor, grasslands and etc.), revenue differences between tourism and herding, and the personal preferences of tourism enterprises and herders. The first two aspects could be gained by directly asking the herders, while the third aspect was somewhat more difficult to ascertain. We tried to learn the preferences of the herders by asking relevant questions such as, "Does operating a tourism enterprise or herding make you more tired?" "Would you like to continue the tourism enterprise if the ongoing drought passes and the revenue gained from herding increases again?" Besides these aspects, the business scale, entertainment, and prices were also surveyed in order to understand the current market for tourism enterprises.

The Descriptions of the two interviews of the sampled tourist resorts (Nuoerbu and Baoyu) are shown in Box 4-2 and Box 4-3, and the relevant data and information are collected and shown in Table 4-4 for analysis and comparison.

Firstly, a comparative analysis of the economic benefits gained from tourism businesses and herding was conducted. As shown in Table 4-4, both the two households generated almost equal amounts of money from their respective tourism business compared with herding. It was found that the tourism industry could be used to substitute stockbreeding somewhat and supplement the household income if the number of livestock was reduced.

Secondly, the herders' preferences for tourism business and herding are analyzed. As shown in Table 4-4, there was a significant difference in personal preference between Nuoerbu and Baoyu for tourism business. Nuoerbu and Baoyu started their own tourism business for different reasons. Nuoerbu began contact with tourists in the early 1990's (e. g. supplied meals to tourists occasionally), but he started his tourism business 8 years later because of reduced revenue from herding. Baoyu commenced his tourism

business as soon as he came into contact with tourists during the 1980's and realized that he could make money from this area. For Nuoerbu, he had to operate the tourism business for a livelihood, even though it was not his preference, that is compared with herding. However, Baoyu's tourism enterprise became a part of his life, regardless of the climate and how much money he gained from herding. It became apparent that Nuoerbu preferred herding to managing a tourism business whereas Baoyu preferred tourism.

Box 4-2 Interview with Nuoerbu (7 July 2001)

Nuoerbu lived with his wife, two sons, two daughters, their daughters-in-law, sons-in-law and grandchildren. It is really a big family with more than 15 people. Nuoerbu recently retired from his position as the general director of his village. His wife was the director responsible for women's affairs in the same village. His eldest son would soon take his place.

Nuoerbu commenced his tourism business in 1998, but actually served tourists much earlier. In about 1990 or earlier, some guests invited by the local government wanted to visit and see the life of a local herder. There was no ethnic-Mongolian cultural tourism at the time, so they were taken to Nuoerbu's house. The reason that Nuoerbu's house was selected was that his living conditions were relatively better than other herders' and he was honest and trustworthy. Also, his house was located outside of the city and maintained a more traditional appearance of a herders' life and was also easily accessible. Guests often looked around his house, rode his horses and ate some homemade dairy products.

Recently, Nuoerbu began to operate his tourism business due to the reduction in herding revenue as a result of the drought and heavy snow disasters in winter.

Since 1998, the scale of Nuoerbu's tourism business has steadily grown. There were 4 Mongolia-style yurts at his tourist resort serving 300-400 tourists in 1998. In 1999, he added one more yurt, and served about 1,000 tourists. In 2000, he added another yurt and tourist numbers remained steady. He planned to add another six felt yurts this summer. The tourists could ride horses or herd sheep for fun, watch a performance of controlling a horse or Mongolian wrestling, and taste some local homemade dishes and dairy foods. For each visitor, he charged RMB ¥50 for one dinner, RMB ¥20 for staying overnight and RMB ¥100 for one day's meal and accommodation.

With the exception of some members of the family working in the local government, most of the other members remained at home for stockbreeding production. They had enough time and labor to operate their tourism business. They could serve 150 tourists in one day and accommodate more than 20 tourists a night. When he commenced his tourism business in 1998, he invited Beijing TV to report his business as news. Otherwise, he has not advertised anymore. He told us that most of the tourists were introduced and led there by the local directors of government. Because his house was near the road and not far from Xilinhot City, there were also some tourists who stopped by when they passed on the road. Therefore, his source of tourists was heavily dependent on his former relationship with the local directors.

Continued Box

His family income reached its peak in 1996 and 1997, of about RMB ¥60,000 ~ RMB ¥70,000. Since then there have been three continuous years of drought and snow disasters, and Nuoerbu has spent an extra RMB ¥60,000 to buy forage to feed livestock during the winter. This resulted in a dramatic decrease of his net revenue from stockbreeding. The household's total income was only RMB ¥20,000 in 2000, half of which was sourced from the tourism business. Nuoerbu explained that the cost was more than the income for his family during these past three years and the forage they borrowed last winter was yet to be paid off.

Because the income gained from herding was gradually reducing, Nuoerbu began to operate the tourism business so as to increase his income. In consideration of the income structure of his family from 1998 to 2000, it was a wise decision with apparent foresight. Nuoerbu noted that he would increase his investment in the tourism business and reduce investment in herding if the climate continued to worsen and if revenue from herding could not be guaranteed. Nevertheless, he also said he would consider whether it was necessary to continue the tourism business if the climate improved and the revenue gained from herding increased. He felt more tired operating the tourism business than herding, and he also thought the tourism business should be carried out without influencing his herding.

Our research revealed that Nuoerbu saw his tourism business, as only a tentative and secondary way of obtaining income when the natural climate was not favourable for herding. He really hoped the climate would improve so that he could give up the tourism business and return to his original simple herding life.

Box 4-3 Interview with Baoyu (July 10th, 2001)

Baoyu lives in Yuejin Sumu(Sumu equals to village or town). His home is near the village but it is quite far from any main roads. We needed to drive for some distance on the grasslands before finally reaching his home. The whole family live in a small courtyard red-brick building. Nearby is a row of colorful flags flying in the wind. Ten Mongolia-style yurts stood in two lines surrounded by the flying flags and were built for accommodating tourists. Baoyu's family tourist resort looks even larger than some other resorts operated by private enterprises.

Baoyu's family is comprised of two sons and a daughter, however the elder son has married. Today only Baoyu and his wife remain in the grasslands, while their sons and daughter live in town. Sometimes the children visit their parents on the weekend with their daughter returning more often than the sons. When she returns, she helps out with some housework and also assists serving tourists. Nevertheless, Baoyu and his wife undertake most of the duties relating to the tourism business. Baoyu was previously a driver for the local tourism bureau, and this played an important role in his initial participation in the tourism business. Judging by the furniture in their house, their income should be above average in the region.

Cotinued Box

When we arrived, several workers were drilling for a well. Water and electricity and other public utilities are usually not available or reasonablely inaccessible for those living on the grasslands. It is necessary to hire professional workers to drill for a well if you need access to water. If no well is available, then an alternative method is to bring water by vehicle. However, one round trip requires more than half an hour. Connecting to high-voltage electricity line would require four transformers, which would cost RMB ¥70, 000～RMB ¥80,000. This is too expensive for Baoyu, so he had to use a diesel engine to generate electricity in his backyard. Baoyu was currently concerned with how to appropriately deal with waste as it had become a problem as the number of tourists increased. In this case, Baoyu buried the rubbish and waste after burning, and his principle was not to damage the natural scenery.

Since the early 1980's, Baoyu had the chance to bring tourists to his home who wanted to visit a herder's family since he was a driver working in the local tourism bureau. He built two Mongolian-style yurts in 1980 and began his own tourism business.

When Baoyu began his tourism enterprise in 1980, he only had two yurts, which then increased to 10 concrete and 5 felt yurts by 2000 which could serve 400 tourists for dinner at the same time, and the 15 yurts could accommodate 200 tourists a night. Horse riding and archery are provided as well as some typical dairy foods made by the family are offered to tourists. Each tourist pays RMB ¥100 per day, including 3 meals and one night's accommodation. Cooked mutton is available for RMB ¥500～RMB ¥600 per whole sheep. It was free for tourists riding Baoyu's horses. Baoyu never advertised his tourism business. Most of his customers were introduced by the local tourism bureau he was working for, and some of the tourists were introduced by his relatives. Since his business has grown larger, the lining up of 15 Mongolia-style at his home is in fact an excellent advertisement, which could also attract some tourists.

In 1996 and 1997, the family income reached its peak. At that time they had more than 700 sheep and earned about RMB ¥30,000 annually from stockbreeding. Their tourism business was also prosperous, from which they earned RMB ¥40,000～RMB ¥50,000 annually. However their income has recently decreased. On the one hand, the drought and snow disasters increased the cost of herding and resulted in a rapid decrease in the quantity of their sheep, which reduced to 300 in 2000. On the other hand, due to the growth in the number of tourist resorts, the increasing competition has decreased their tourism income. Furthermore, the degradation of the grasslands is less attractive for tourists and thus caused a decrease in tourism income. In 2000, the family's total annual income decreased to only about RMB ¥20, 000, in which herding and tourism accounted for 50% respectively.

Baoyu has operated a tourism business for almost 20 years, and the income from this accounted for about a half of his total annual income. The families expressed that they felt no more tired in operating a tourism business than herding, but operating a tourism business needed an increased amount of attention. Furthermore, they said they would like to continue operating their tourism business even if the climate improved and the income from herding increased. "Two ways for income is always better", she interpreted the idiom or "Don't put all your eggs in one basket" in her own way.

Table 4-4 Tourism businesses comparison between Nuoerbu and Baoyu

	Nuoerbu	Baoyu
Income from herding (2000)	RMB ¥10,000	RMB ¥10,000
Income from tourism business (2000)	RMB ¥10,000	RMB ¥10,000
Personal preference	Preferred herding to tourism, hopes to live only off herding	Tended to develop both herding and tourism business

As shown in the Table 4-4, there existed marked differences in the personal preferences in operating a tourism business. The problem was whether and how such differences would affect the development of tourism in XBR. To answer this question, we had to determine whether there was a "systematic preference"—most herders generally liked or disliked operating a tourism enterprises. Only a "systematic preference" would affect the level of community participation in their tourism enterprises as a whole. Through our investigations, we found there were a variety of attitudes to tourism enterprises: some thought it was a new way to make money and actively participate; some chose tourism just as a tentative approach during times of hardship for herding and hoped to return to the original simple herding life soon; some believed both the tourism business and herding should be developed at the same time, and they hoped to make money through a variety of ways.

The survey showed that nobody expressed dissatisfaction to those who participated in tourism enterprises, though some of them did feel it was difficult at the beginning of stage. Generally speaking, for these herders, there was neither a "systematic like" nor a "systematic dislike" towards their tourism business, they were generally quite neutral. This conclusion was natural and reasonable since the individual's preferences are granted to be different.

Next we considered the possibility of popularizing this kind of tourism business which was owned and operated by individual herders. The major parallel between Baoyu and Nuoerbu was that both of them utilized their social connections to introduce tourists into their tourism business. Advertising requires a lot of money, as does directly connecting with travel agencies. How to attract tourists would be a problem for most herders who want to operate a tourist enterprise. Nuoerbu and Baoyu solved this problem by utilizing their existing social relations. From this perspective, they had their own advantages in operating their tourism enterprise.

Actually this advantage played a decisive role at the commencement of their tourism enterprise. In other words, they could not operate a tourism enterprise without this advantage. Therefore, their social connections were somewhat a prerequisite to commence their tourism business in the area. If this were true, then this would restrict

other herders from establishing their own tourism enterprise.

The survey also showed that what Nuoerbu and Baoyu offered to tourists was almost identical. Actually the lack of special characteristics was one of the reasons for their poor retention of a tourist market. The entertainment activities offered by one tourist resort could be completely substituted by many others. So special tourism characteristics might be a key aspect for a successful tourism business in XBR.

4.2.3.3 Joint management of herders

There was only one tourist resort owned and operated jointly by several households in XBR, named Aoqi tourist resort. Aoqi started its tourism business in the summer of 2000. They were preparing for the coming tourism season when we arrived for the interview. We interviewed the head of Aoqi, Zhaona, as well as one of the partners, Haobusihalitu, and a herder who had leased his grasslands to Aoqi village, respectively. We tried to learn about their operational mechanism through conducting interviews with them, and then compared their situation with that of the above individual herder managers so as to analyze which method was more suitable for the local community in the present setting.

Aoqi tourist resort originated from "Aoqi" research institute which was owned by Zhaona, and was registered in September 1997. Its main research was concerned with grassland culture and folk-custom tourism. In order to practice real ecotourism, Zhaona organized 4 herder households to commence folk-custom tourism in the summer of 2000, and became the head of the village.

Aoqi village chose an appropriate and flourish grassland and hired enough herders for the tourism business for about 2 months every tourism season. The involved herders purchased for themselves Mongolia felt yurts and horses and then combined these to establish Aoqi village. The daily tourism program in Aoqi village involved a welcoming ceremony, with performances of singing and dancing, a horse show and a traditional cooking exhibition. The herders could carry out these performances without any training. A total of 18 people from 4 households in Aoqi village did all the work without a clear distribution of responsibilities. Zhaona managed the daily work including managing all the herders, distributing income and making contacting with other companies such as tourism agencies.

In 2000, there were 18 Mongolian-style yurts in Aoqi, which could hold 60-70 tourists at most. They served 2,500 tourists during the two peak tourism months. Their entertainment and other charges were as follows: welcoming ceremony in traditional Mongolian custom (RMB ¥200), welcoming ceremony with a team of horses (RMB ¥300), Mongolian singing and dancing show (RMB ¥500), horse racing performance (RMB ¥120), horse controlling show (RMB ¥300), accommodation (RMB ¥30 per person per night), and a typical Mongolian dinner (RMB ¥40).

The revenue of Aoqi in 2000 was about RMB ¥30,000, which was distributed among the relevant households according to their work and their assets they had invested in, such as yurts, horses and cows. Therefore their income varied from several hundred yuan to several thousand yuan.

4.2.4 Comparison between individual and joint herding managers

In order to analyze the possibility of developing tourism to reduce the pressure of over-grazing in XBR, a comparison between the individual herder tourism managers (like Baoyu and Nuoerbu) and joint management (like Aoqi) was conducted.

Jointly operating an enterprise could reduce the cost and increase profits, which are referred to as "economies of scale". Tourism businesses also follow this rule, operating corporately like Aoqi village which could result in reduced costs and more profits. Operating as a corporation could reduce the initial cost of investment and advertising for each household in comparison to operating as an individual business. Based on the data we gathered, Nuoerbu and Baoyu served about 500-1,000 tourists and earned RMB ¥10,000 respectively in 2000, while Aoqi village served 2,500 tourists and earned RMB ¥40,000 in that year. So it seems that operating as a corporation could make more profit.

The capacity of the manager would play an important role for the further development of a joint operator tourist resort such as Aoqi village. It was discovered during our survey that management in Aoqi village was not very consistent. On the one hand, they lacked clear work assignments among the involved herders, so it was hard to run the village in a highly efficient manner. On the other hand, they lacked more effective mangers like Zhaona. Generally, lacking intelligent and capable managers would be the greatest impediment in expanding the scale of tourism and increasing its service quantity.

For those tourism businesses operated by individual herders, the biggest problem they faced was how to attract tourists. The survey revealed that some herders had planned to operate a tourism business, but hesitated when they considered how to attract tourists without any connections. Another significant problem was financing. Some herders failed to start a tourism business because they lacked the initial capital.

From the perspective of the possibility of developing tourism to partially substitute herding, both mechanism have certain advantages and disadvantages. Operating a tourism business individually encounters difficulties with attracting start-up finance and tourists, but their revenue distribution and business management remained relatively simple. Operating a joint enterprise was more suitable for those who lacked adequate funding to start a tourism business. They could cooperate with others with capital so as

to assist them in commencing their tourism business, however this kind of business mechanism requires a series of management regulations and especially capable managers.

4.2.5 Conclusions and suggestions

Based on the above analysis of the three types of tourism managers, it was revealed that the majority of tourism enterprises in both scale and benefits were operated by non-herders within XBR. Furthermore, these businesses rarely contributed to the local economy. However, the tourism enterprises operated by herders individually and jointly were more successful in involving the community in the tourism business and provided the greatest benefits to them, yet their scale and influence were still relatively small and they required support from the government.

Some suggestions on how to involve the local community in tourism and ensure appropriate economic benefits are outlined below:

(1) Improve the local herders' consciousness of the market economy and provide relevant skills through special training. It is very important for XBR administration to provide them with some training about these basic skills as well as some relevant knowledge on dealing with tourism enterprises and provide the necessary information.

(2) Help local herders to resolve the financial problem of starting a tourism business. These financial problems could be resolved in many ways. The XBR administration could help the local community to apply for funds from the government, such as the National Funds for Western Tourism Development. Furthermore, the XBR administration could assist them in obtaining loans from banks, and introducing funds from relevant international organizations and non-government organizations as an alternative.

(3) Ensure the promotion of local community participation in tourism through relevant management measures such as concessionary management, which could give greater priority to tourism enterprises managed by the local community. However this should not exclude outside tourism investors. Currently, most of the local managers lack tourism operating experience, so they require to be trained in the relevant knowledge and skills. They should obtain this necessary knowledge and experiences through cooperation with outside managers. As a result, the local practitioners could obtain the maximum economic benefits, while decreasing the social economic costs.

(4) Encourage tourism business owners to employ local herders as much as possible through the use of relevant polices, such as reducing their taxes. If more local herders were employed in the tourism industry and obtained an adequate salary, then the over-grazing situation would be alleviated to some degree.

(5) Help local community participation in tourism through a variety of ways.

Mongolian-style yurts or hotels should be established to serve tourists as one of the ways to involve the local people in tourism enterprises. Besides, there should be many other ways to absorb them into tourism businesses. Actually, the clothes and decorations of the local herders, and even some daily appliances could be interesting souvenirs for the tourists. It is obvious that the local people could obtain considerable income from the development of a souvenir market. Xilingol dairy foods reflect typical Mongolian characteristics and should be included in the tourists' menu. Almost every local family can produce dairy foods within XBR, so there could be an extensive market if they improved the packaging of such foods and sold them to tourists. Besides, tourists are very interested in traditional Mongolian entertainment, which could also be a good way to increase the income from tourism.

(6) Expand the number of tourist visitors through advertising. Both Nuoerbu and Baoyu commenced their tourism enterprise only when the number of tourists was guaranteed. For herders who lack the connections to introduce tourists, they require assistance from the local government in advertising so as to attract tourists in the difficult initial stages.

4.3 Xilingol Biosphere Reserve and Ecotourism Management

The necessity and feasibility of developing ecotourism as one of the sustainable ways to utilize the grasslands within XBR are analyzed and discussed above. Nevertheless, it is necessary to clarify the difference between ecotourism and mass tourism. Here we define ecotourism as a stricter form of tourism requiring scientific management so as to ensure that all the relevant stakeholders (the natural environment, the local community, tourism practitioners and visitors) benefit. Therefore, the XBR administration should play a key role in managing tourism based on the MAB concept to ensure it develops in a sustainable way. In the following context, the existing problems of tourism management in XBR are analyzed based on the status of tourism development within XBR, and then some suggestions on how to improve the management and supervision of the XBR administration are supplied.

4.3.1 Status of ecotourism development in XBR

Tourism within XBR appeared as an industry in 1997. Presently, there are a total of 40 tourist enterprises within XBR, among which 15 are large scale enterprises. There are also 4 travel agencies and 8 large souvenir outlets. Tourism facilities in Xilinhot City include 4 luxury hotels with 625 beds, 5 hotels appointed to serve foreigners with 481 beds, and 41 budget hotels with 1,455 beds. There are also 3,800 registered taxis.

Based on statistical data, the total revenue from tourism in XBR was RMB ¥79.3 million in 2000, which included the following three components: firstly, RMB ¥25.52 million was from hotel accommodation in Xilinhot City; secondly, RMB ¥3.78 million was from tourist enterprises located on the grasslands; and thirdly, RMB ¥50.0 million sourced from tourism incomes. As shown in Fig. 4-2, the revenue from the sale of souvenirs accounted for 63% of total revenues, revenue from accommodation accounted for 32%, and only 5% came from tourist enterprises. This means that only 5% of tourism revenues were generated from and remained in the pastoral areas, while 95% flowed outside, although it was the grasslands resources which attracted the tourists in the first place. Therefore it is apparent that the local herders only gained a small part of the benefits from tourism within XBR, and most of the profits remained within the city. One of the main reasons why very little income remains on the grasslands is because the present tourism activities are unable to attract tourists to remain on the grasslands for longer than one day. Most of the current tourists stayed in Xilinhot City and only spent the day on the grasslands. So the only way for those tourist resorts to make any money was by supplying food to tourists. Obviously, this is not an appropriate pattern for tourism on the grasslands. Time limitations restrict the distance tourists can realistically cover for enjoying the natural scenic beauty and traditional customs of the Mongolian lifestyle on the grasslands.

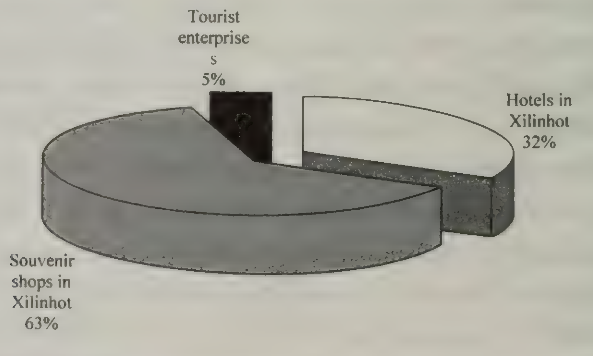

Fig. 4-2 Structure of tourism revenue within XBR in 2000

The survey and analysis reveals that tourism within XBR is significant in its early stages. Tourism is not yet to reach a considerable scale and revenue from tourism only contributes 4% to local GDP. Most revenue is sourced from accommodation and shopping, yet a significant potential market exists to develop tourism products. However, the channels and mechanisms required for involving the local community in tourism are not yet to be established.

Nevertheless, although the tourism in XBR is still in its initial stages and it has already shown some benefits to the local economy and to environmental protection. The

mutton and dairy products serving tourism mainly come from local producers. In 2000, the 13 main tourist enterprises within XBR consumed 3,160 barbecued sheep. Cooked sheep sell for RMB ¥600, so this generated RMB ¥1.896 million income. Moreover, income from selling dairy products was RMB ¥0.60 million. The sum of the two items totals RMB ¥2.496 million.

From the perspective of providing employment, the tourism industry requires plenty of employees with low technical requirements. It is a suitable way for local herders to work to increase their income. The survey showed that each tourist resort employed 21 workers on average within XBR, and the average salary was about RMB ¥300~RMB ¥400 per month for each employee, so that everyone could earn about RMB ¥1,000 within the 3-months tourist season. This is quite a significant salary for a herding household. Moreover, the stockbreeding in these 3 months (July, August and September) requires little labor, so most of the herders would be interested in gaining additional income through becoming involved in the tourist industry.

Furthermore, tourism could widen the local herders' horizons. Being involved in the tourism industry for Baoyu, Nuoerbu and Aoqi tourist resort has improved their understanding of the market economy. Meanwhile, they also have been able to maintain their traditional culture through developing it as a tourism product.

4.3.2 Status and problems of tourism management in XBR

Tourism development on the grasslands is closely reliant on the natural environment. If the grasslands continue to degrade, it would be unattractive for tourism and result in a reduction of tourism revenue. Therefore, tourism management within XBR is particularly crucial.

The XBR administration has paid close attention to education of the public. In 1999 a 600 m^2 information center was established within XBR supplying environmental and ecological information for visitors and local people. Some bulletins about XBR are also available at the center. Nevertheless, the XBR administration has not played its expected role in tourism management due to many problems, such as the property rights of the land and the operating system of the nature reserve which are discussed in the other relevant chapters of this book. The problems of tourism management facing the XBR administration are presented and analyzed in the next section.

(1) No monitoring and approval rights for the operation of tourism enterprises. According to our investigation, there were dozens of tourist enterprises of different scales within XBR. These enterprises should be firstly approved by the many managing departments such as the business bureau, revenue bureau, tourism bureau and public health bureau before commencing operation. However, it is surprising that the XBR

administration, the most important department in managing the natural resources within the reserve, have no rights to monitor and approve the operation of these tourist enterprises. All of these tourist enterprises are located within XBR and according to the 29th item of the REGULATIONS OF THE PEOPLE'S REPUBLIC OF CHINA ON NATURE RESERVES, all tourist activities carried out within nature reserves cannot operate before the reserve administration proposes a plan which is approved by the provincial and local government. In XBR, since the administration was excluded from approving the operation of tourism enterprises, the XBR managers did not know exactly how many tourist enterprises operate within their jurisdiction nor what kinds of tourist activities were being undertaken. For the tourist enterprises, the investigation showed that most of them did not know that their business were within a national nature reserve or a biosphere reserve. Most of them only knew Baiyinxile ranch belonged to the area of the nature reserve, but few of them knew that XBR was as large as the entire Xilin River catchment and even included Xilinhot City.

(2) No approval rights for tourism planning. Until now there are no long-term plans for tourism development in XBR. Xilinhot City tourist bureau has developed a tourist plan for Xilinhot City, however this is only from the perspective of the tour operators, while there were no considerations for environmental conservation. This plan was approved by other management departments, with the exception of the XBR administration. Due to various reasons, the local government does not recognize the need for tour activities and enterprises within XBR to be managed and planned by the XBR administration. In 2000, the central government utilized some of the capital from the western development finance to support infrastructure construction for the development of tourism in the west, and tourism on the Xilingol grasslands was fortunately listed in the 77 projects that would receive financial support. Xilingol league obtained RMB ￥8 million for developing tourism, and distributed only RMB ￥1 million to support tourism within XBR due to the poor quality of the Xilingol region proposal proposed by Baiyinxile Ranch. This RMB ￥1 million was not distributed to XBR administration but to Baiyinxile ranch where the most attractive tourist resources are located. Due to poor tourism planning, this money did not bring any economic benefits for local development.

(3) No detailed management measures. As a result of the lack of tourism approval and planning rights, the XBR administration is unable to control and manage the routes, activities and scope of tourism in XBR. Tourism within the nature reserve has become a double-sided sword, which could generate substantial benefits on the one hand and bring negative effects for the environment on the other hand (Li 2000). It requires rigorous scientific management to fulfill its positive function and avoid its negative influences.

In addition to scientific planning, the most important work carried out is

environmental monitoring of the environmental effects caused by tourist activities. However, environmental monitoring systems and procedures are lacking for tourism activities within XBR. Currently, tours of the grasslands lack any real natural features in their itineraries nor any concern for the impact of tourist activities on the natural environment. Therefore, the management measures become especially important in preventing tourists from damaging the grasslands or picking endangered plants. Since there is no effective management of tourism, waste and sewage from the tourist enterprises are uncontrolled. Our investigations showed that most tourist enterprises dug some nearby shallow pits to fill in their daily garbage in order to prevent the natural scenery near their tourist enterprise from being destroyed. However, the wind on the grasslands are very strong in the winter, so much of the garbage is easily exposed by the wind after the tourist season and strewn across the grasslands. The sewage from all the tourist enterprises is another problem, especially if it is not treated before being discharged onto the grasslands. Such environmental problems may not be apparent in the initial stage of tourism, but they will become obstacles for the ongoing development of tourism if they cannot be resolved as soon as possible.

4.3.3 Suggestions for the XBR administration

Based on the above analysis, some suggestions are offered to the XBR administration.

(1) Perform the rights of monitoring and approving tourism enterprises and planning. In addition to the REGULATION OF THE PEOPLE'S REPUBLIC OF CHINA ON NATURE RESERVES, the People's Congress of Inner Mongolia Autonomous Region issued the REGULATION OF XILINGOL GRASSLAND NATURE RESERVE in 2001. These two regulations should ensure the rights of approving and managing tourism business and planning for the XBR administration. The XBR administration should fully utilize these existing regulations to actively perform its rights in managing the areas' natural resources. Of course, this will first require the support and cooperation of governments at all levels (provincial, league and city).

(2) Adopt rigorous management measures. Based on the management rights, rigorous management measures should be adopted to monitor and manage tourist activities, so that the goal of sustainable development could be achieved. For example, indicators and procedures of environmental monitoring for tourist activities should be established; long-term environmental monitoring of the impacts caused by tourism should be carried out; establish service and management measures for tourists; set up a mechanism which ensures the management of community participation; enact management measures for the practitioners of tourist enterprises.

(3) Fully utilize the natural advantages to provide tourism services. The XBR

administration has its own natural advantages as a manager of tourism. Firstly, natural resources are the property of the nation, and the nature reserve administration is the manager of these natural resources on behalf of and for the benefit of the nation. Therefore, this kind of role will be beneficial for the reserve administration to justly manage the activities of tourists from the perspective of natural resource conservation. Secondly, the ultimate purpose of developing ecotourism in a nature reserve is to achieve the sustainable development of the regional economy and environment, which is in accordance with the managing objectives and ideas of the MAB program under UNESCO. Therefore from the perspective of management, the XBR administration is the most appropriate department to manage tourism within XBR. Thirdly, the daily work of the reserve administration, such as environmental monitoring and public education, are similar to that needed for the management works of ecotourism. Therefore from a practical management perspective, the reserve administration has more advantages than other management departments.

The XBR administration should fully utilize its own advantages to take on the duty of management and actively provide relevant services to tourism. For example, XBR can utilize the international brand of UNESCO/MAB reserve to advertise and increase the awareness of tourism sights for attracting visitors. Some training can be held to help the local herders operating a tourism enterprise or in supplying tourism services. Information about ecotourism and relevant foreign experiences are also very useful for the local community. The XBR administration can also help introduce the eco-toilet and effective wastewater treatment facilities. As long as focusing on the benefits of the local community, the XBR administration will be able to play its expected role to achieve the goals of protecting the areas rich natural resources.

CHAPTER 5

THE RELATIONSHIP BETWEEN AN URBAN AREA AND A NATURE RESERVE: XILINGOL BIOSPHERE RESERVE

5.1 Introduction

The modern concept of establishing nature reserves did not commence in China until 1956 with the establishment of Dinghushan Nature Reserve, in Guangdong Province by the Chinese Academy of Sciences (CAS). Sixteen years later in 1972, China first participated in the activities of UNESCO's Man and the Biosphere (MAB) Programme. The MAB Programme aims to study the construction and function in different area of Biosphere Reserve and forecast the effect of human activities on the Biosphere Reserve and its sources. At the same time, scientific data and theoretical foundation will be provided for the reasonable exploitation and protection of nature resource. In 1984, China became a member of the International Man and the Biosphere Reserve Network (China-MAB Committee 2001). By 2002, China had established 1,276 nature reserves, occupying 12.44% of its territory. Of these 155 are national level nature reserves and 23 are members of the International Biosphere Reserve Network and are playing a very important role in conserving China's unique ecosystems and rich biodiversity.

However, most of China's nature reserves currently face many problems in effectively carrying out their management functions. In addition to lacking a stable and adequate source of funding, there exists an acute contradiction between nature conservation and the development of the local community, who often struggle to maintain a subsistence existence (Han 2000). Furthermore, most nature reserves contain or support large populations of local inhabitants who often cause serious damage and degradation to their ecosystem, especially in steppe-type nature reserves. It is therefore necessary to carefully improve the relationship between conservation and development. One possible solution may be to utilize the potential of ecologically healthy cities or small towns to attract displaced populations from the surrounding degraded grasslands.

Urbanization is usually the result of a concentrated population of a city or town which serves as a center of politics, economics, commerce, transport, education, information and culture etc. From this perspective, the degree of urbanization is normally regarded as an indication of the level of development (Simpson 1993). China currently has an urbanization ratio (population in cities and towns divided by total population) of about 40%, which is much less than the 70%—80% average in developed countries. It is possible that these urban centers could offer an effective solution to lessening the huge population pressures in areas suffering serious degradation, such as in grassland or desert ecosystems. In 2000, the MAB programme introduced the concept of incorporating urban issues into the management of biosphere reserves (UNESCO 2000). The original intention of the concept was to combine the advantages of both nature reserves and cities to solve the contradiction between conservation and development. However, this concept is relatively new with no real demonstration case studies to date. Although there have been some studies on the functions of natural ecosystems in supporting urban populations (Folke et al. 1997), there have been no studies on the relationship between a specific city and nature reserve. Many nature reserves in China are confronted with the dilemma of how to manage the growing demands of urbanization within or surrounding their buffer zone, e. g. Fukang City in Bogda Biosphere Reserve, Xinjiang Autonomous Region, and; Xilinhot City in Xilingol Biosphere Reserve, Inner Mongolia Autonomous Region (IMAR). In this paper, we chose Xilingol Biosphere Reserve (XBR) as a case study. The main reason for selecting XBR is because this area is currently facing serious grassland degradation, and the relationship between XBR and Xilinhot City and other small towns is poorly understood. The aims of this paper are therefore, firstly to examine the relationship between the nature reserve and the urban area, and secondly, to develop a solution to the ongoing serious degradation of the steppe by applying the MAB programme's urban concept.

5.2 Field Investigation and Data Collection

5.2.1 The study area

Located in Xilingol League (league means alliance in Mongolian), IMAR (IMAR government is equivalent to the provincial level found elsewhere in China, and is the highest organ of government below the central government. League is the next level down) XBR (N 43°02′-44°52′, E 115°13′-117°06′, A 988 m) covers an area of 10,786 km^2 and encompasses a population of 134,000. XBR was founded in 1985 and become a member of the World Biosphere Reserve Network in 1987. The major land use patterns within XBR include livestock pastures, fishing, forestry, agriculture, coal and oil

mining, as well as urban settlements such as villages, cities and small towns (Xilingol League Editorial Committee for Integrated Records, 1996). The original design of including Xilinhot City within the transition area of XBR was and remains, from a strategic point of view, quite significant in the reserves ongoing development. Xilinhot City may offer a viable and sustainable solution to protecting the integrity of the steppe ecosystem as well as the watershed of Xilinhe River. Baiyinxile Town was also included within Xilingol Biosphere Reserve for similar reasons. However, since the establishment of XBR many problems have emerged regarding the management and design of the biosphere reserve. For example, the core areas occupy a mere 0.17% of the whole biosphere reserve and are themselves faced with serious degradation. Furthermore, there is the difficulty of raising the standard of living of the local population without further exacerbating the existing environmental situation. Presently, the development of the local economy has little or no relationship with conserving nature or protecting the long-term ecology of the steppe.

5.2.2 Field survey

The current research was jointly carried out by scholars or management officials from MAB-China National Committee, Institute of Botany, the Chinese Academy of Sciences, Peking University, Inner Mongolia University, University of Melbourne, and the XBR Management Bureau. Five investigative field trips were conducted from May to September, 2001. These field surveys began on the steppe in XBR's core and buffer zones and then spread out to include the transition area, especially centred on Xilinhot City. The surveys included a simultaneous investigation of the geographical position, vegetation, land use patterns and customs of the traditional Mongolian lifestyle.

5.2.3 Historical data collection

Historical data and records on population, livestock number, land area, industrial and pastoral incomes etc., were obtained from the Statistics Bureau of Xilingol League (Inner Mongolian Science and Technology Association and Administrative Department for Xilingol League, IMAR, 1995; Xilingol League Yearbook Editorial Committee, 2000). This data goes back to 1947, two years before the foundation of the People's Republic of China in 1949. Other data was obtained from other relevant administrative offices in Xilinhot City, including the Agricultural Bureau, Forestry Bureau, Environmental Protection Bureau, Livestock Bureau, Commerce Bureau, and Xilingol Biosphere Reserve Management Bureau. Semi-structured interviews were carried out with herders, livestock farm managers, tourism operators, enterprise managers and

government officials within the buffer zone of XBR and in Xilinhot City. The calculation of data and figure processes were performed on a Sigma-Plot 4.0 program.

5.3 Relation between Urban and Biosphere

5.3.1 The urban role in buffering population pressure

In the interests of conserving XBR's environment, then it is essential to incorporate development of industry, commerce, mining, energy, livestock production, ecotourism, culture and education in urban areas. This coordination is especially important if the urban areas are to continue to facilitate an absorbing role for the majority of XBR's population. This development should advance in a sustainable and healthy manner as Xilinhot City only covers an area of 18.7 km^2 or 0.17% of the XBR's total area, however, it hosts a population of 124,000 or 92% of XBR's total population 1.34×10^5 (Quan 1993). That is to say, Xilinhot City utilizes merely 0.2% of the land area to support 92% of XBR's population(see Fig. 5-1). Besides, this large part of population is with high quality who show apparent higher environmental consciousness than the pure herders in the buffer zone of Xilingol Biosphere Reserve. Because those herders suffer much more from poverty. The largest of these towns, Baiyinxile, with a population of 5,016 or 50% of the total of Xilingol League's urban population, is situated within XBR's buffer zone. However, the settled area of the town area is only 3 km^2 or 0.08% of its total area. Throughout Xilingol League, the ratio of town area / total area for town purpose varies form 0.04% to 4.54% (including mining lands)

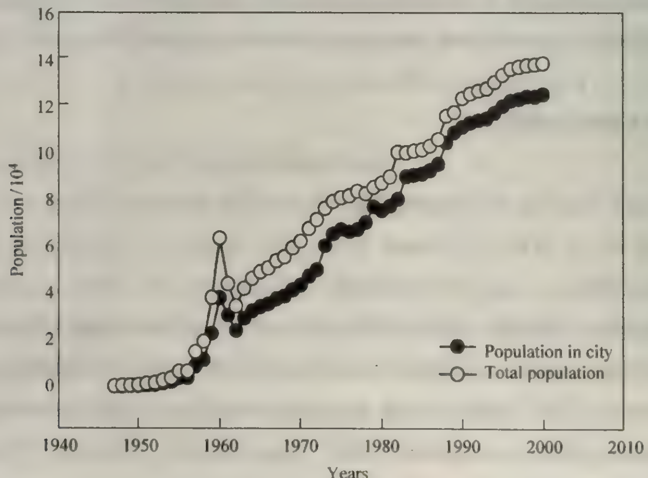

Fig. 5-1 Change of population in city (town) and total number in Xilingol Biosphere Reserve

(Table 5-1), while towns hold populations of 30%—92% in the League.

Table 5-1 Land use patterns in Xilingol League, Inner Mongolia, with the percent (%) of town/total land areas (hm^2). The pattern of land coverage was investigated in 1996 (Inner Mongolia Science and Technology Association & Administration Hall for Xilingol League of Inner Mongolia Autonomous Region, 1998)

Region	Grass land	Farm land	Wood lands	Waters	Transportation	Towns	Total	Towns/total/%
A'baga Banner[1]	2,688,510	816	10,068	42,081	2,322	5,703	2,759,400	0.21
Duolun County	242,195	93,419	33,512	1,671	2,243	4,260	377,300	1.13
East Wuzhumu Banner	4,660,000	21,195	28,280	35,608	5,945	4,301	4,755,400	0.09
Sunite Left Banner	3,314,775	253	11,036	17,101	2,541	1,194	3,346,900	0.04
Sunite Right Banner	2,633,081	9,999	202	9,194	2,907	12,617[2]	2,781,555	4.54
Taipusi Banner	175,199	140,389	12,057	4,569	3,458	5,828	341,500	1.71
West Wuzhumu Banner	2,166,900	5,584	105,080	9,683	3,281	5,501	2,296,000	0.24
Xianghuang Banner	487,773	2,174	2,120	1,714	723	1,496	496,000	0.30
Xilinhot City	1546697	16,978	1,505	4,053	2,980	3,575[3]	1,607,964	2.22
Zhenglan Banner	900,971	27,790	48,970	13,293	2,438	2,838	996,300	0.28
Zheng Xiangbai Banner	563,339	26,634	10,683	3,815	1,159	2,670	608,300	0.44
Total	19,379,482	345,231	263,513	142,782	29,997	195,714	20,366,019	0.96

[1] Banner equals to County.

[2] Coal Mining areas included.

[3] Urban area (downtown area, 1,500 hm^2) included for this region.

5.3.2 The economic benefits of a sustained urban role

Among the various economic activities in XBR, the macro-agriculture sector (representing traditional agricultural, forestry, pastoral, part time occupation or trading and fishery industries) clearly occupies an important position. Nevertheless, economic activities within this sector in the urban area, such as transportation, commercial, construction and service industries, show clear signs of increasing (Fig. 5-2 A). As for the micro-agricultural sector, including those incomes dominated by township type industries, part time occupation and fishery, have recently increased in most of XBR's villages (Fig. 5-2 B). Such a phenomenon is especially beneficial for lessening the pastoral pressure cast on the steppe ecosystems. The specific roles of both urban and town areas in the development of Xilingol Biosphere Reserve are listed in Table 5-2.

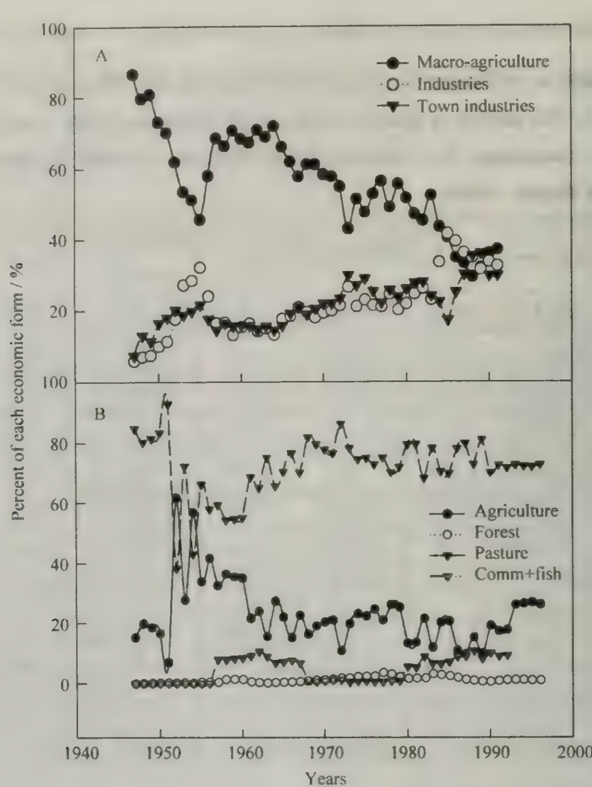

Fig. 5-2 Changes in the percent (%) of different economic forms of micro-agriculture, industries and town industries (A), and the agriculture, forest, pasture and commerce + fishery (those five components making up macro-agriculture) (B), since 1947 in the Xilingol Biosphere Reserve, Inner Mongolia, China.

5.3.3 Food supply to the urban area from the Biosphere Reserve

Both Xilinhot City and Baiyinxile Town both heavily rely upon XBR for their food supply, especially on dairy and livestock produce. Since most of the dwellers, in grazing land are Mongolia natives who prefer more meat than grain, so such a diet custom is of no difference from that in the pure pasturing areas. Those foods, therefore, are mainly imported from the surrounding buffer zone of XBR. Each year, the herders in XBR, maintain about 9.7×10^5 sheep and goats, 8.4×10^4 cattle and horses, together with an output of 1.6×10^4 ton grain. The bulk of these products, except for the portion consumed by the local people themselves, flows directly into XBR's cities and towns. During the period 1981-2000, the average amount of beef consumed in Xilinhot City was around 200 ton a^{-1}, and there were increasing trends of mutton consumption. Recently, some 1,724 ton of mutton and 236 ton of beef were sold, most of which was sourced from the surrounding grasslands of XBR (Fig. 5-3).

Table 5-2 The functions of Xilinhot City and Baiyinxile Town on the development of local societies in the Buffer Areas of Xilingol Biosphere Reserve, Inner Mongolia, China

Functions	Direct ways	Indirect ways
Personal Training & Education	Scientific management ideas (natural conservation, plant and animal, stock raising, irrigation works, fishery), adult education (technique, occupation, continue education), obligation education (elementary, middle, vestibule school), market economy (market planing, mechanism, quality, vendition), training (eco-tourism, scientific and technological centre)	Shifting in ideology, strengthen in demeanour and legal system, absorbing information from the out world, especially network information, improvement of ethical quality (Mongolia)
Science & Technology	Technique popularizing, scientific and technological dissemination, experiment, technological market, environmental and ecological monitoring, experimental facilities	Potential functions in the scientific and technological ideas, formation of scientific and technologic markets, increasing land use efficiency
News, propaganda & entertainment	Cultural facilities, folk civilization, broadcast and TV (satellite television in the pasturing areas, wired TV, information service through TV), construction of culture in pasturing areas (traditional and contemporary)	Gaining news from both inland and abroad, culture going to the countryside
Sanitation & medical care system	Elementary health protection, moving hospitals, public setting-up exercise facilities, town and city hospitals	Release from difficulty illness, fight, rescue or eliminate calamities
Folk gymnasts	Folk gymnasium, horse race	Popularization of Inner Mongolia folk gymnasts
Social guarantee & service	Insurance, public security, welfare; Social multi service (vendition and maintenance of farm tools), labor and capital market, scientific and technology consultant, information service, banking system, post and communication, construction in the pasture areas, supply of water, electric, gas, central heating	Obtaining necessary materials for livelihood in the pasture areas, market exchanges of productions

There are two main side effects for the city due to its reliance on sourcing its food supply from the nature reserve. On the one hand, it can stimulate the development of XBR's economy which is a necessary precondition for improving conservation, and on the other hand, environmental pressure might be increased especially when the grasslands are degraded. To avoid this problem, higher efficiency in land use is necessary in areas with technological and financial guarantees in or around XBR.

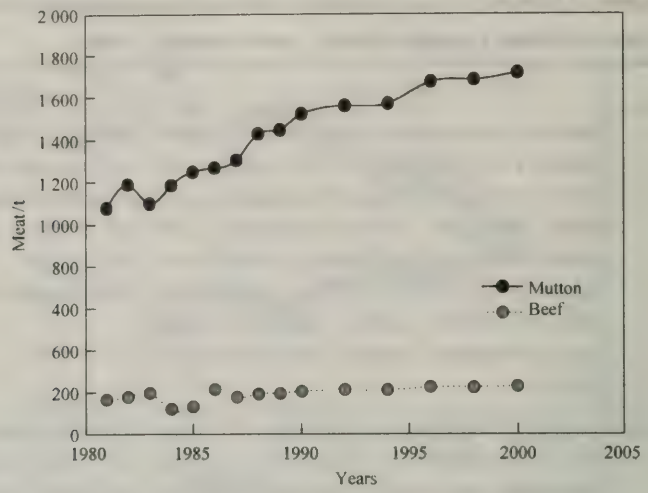

Fig. 5-3 The amount of meet consumed in Xilinhot City since 1980. Most of the food comes from the Buffer and Transition Areas of Xilingol Biosphere Reserve in which the City locates

5.3.4 Urban water supply and the Biosphere Reserve

Xilinhot City is located in a continental monsoon region of semi-drought and semi-frigidity with an annual precipitation of approximately 350 mm, but an evaporation rate of more than 1,694 mm. Therefore, it is a city faced with a serious water shortage. The amount of water consumed by the city is relatively high, and such a consumption rate will increase with the rapid population growth (Table 5-3). It is predicted that by 2020, the total amount of water needed for industry, agriculture and personal consumption will reach $7.4 \times 10^7 m^3$. At present, the main means to get drink water for the citizen is taking out from underground. With the growing population, however, over extraction of underground water reserves will cause many ecological problems in Xilinhot City, therefore much of water should be compensated by the ground water supply within XBR. The Xilin River, which has a water surface of more than 3,852 km^2 and an annual runoff of $1.8 \times 10^6 m^3 \cdot year^{-1}$, is a very important water source to maintain a continual water supply for the City. As a result, Xilin River is known as the Mother River of Xilinhot City. The river's catchment area is distributed throughout XBR, and therefore the health of the biosphere reserve plays a very important role in the conservation of water resource to Xilinhot City. So both the water quality and quantity largely rely upon how XBR's natural ecosystem is conserved.

Table 5-3 Prediction of water consumption in Xilinhot City ($\times 10^6$ m^3), Xilingol League, Inner Mongolia, China

Items	1990	2000	2020
Drinking[1]	5.0	8.7	13.8
Livestock	3.6	3.6	4.3
Industries[2]	10.6	15.5	36.9
Agriculture	5.6	6.4	7.1
Forage grass irrigation	1.5	8.2	12.0
Total	26.3	42.5	74.1

[1] Drinking for shack and hobo population is included

[2] Water saving methods for industry consumption are considered

5.3.5 Ecological and environmental barrier

Xilinhot City is praised as "a city within the grasslands, and a grassland within a city", thus implying an expectation of a high-level of environmental quality. Currently the city suffers very little industrial pollution, mainly due to the low presence of heavy industry. During summer a beautiful landscape is evident with strong steppe characteristics. However, in recent years during winter and early spring, serious sandstorms have frequently occurred as a result of the serious grassland degradation. In fact, the development of the city has also suffered as a result of this steppe degradation in comparison with the rest of the Inner Mongolian region. This will be further discussed in the next section. To overcome such a calamity, revegetation and conservation of all the natural grasslands within XBR and other neighbouring areas should be emphasized and eventually realized, so as to establish an ecological protection barrier to Xilinhot City and other small towns.

5.4 The Role of Urban Areas in the Restoration of Degraded Grassland

5.4.1 Causes of steppe degradation

In 1999, the degree of overall degradation within XBR reached 82% of the total area, with a total degraded area of 7,689 km^2 (Wang, Dong and Yang 1996). Heavy and medium degradation comprised some 27% and 25% respectively of this area. As a result, serious sandstorms (*shachengbao*) have become more frequent, occurring 14 times in 2000 and 16 times in 2001 in Xilinhot City during winter and early spring. These serious sandstorms often impact upon the cities of Beijing and Tianjin, and have even become a concern on the Korean Peninsula and in Japan, due to the long-distance

transportation of the dust particles with prevailing winds. Some of these sandstorms have been so large as to become a serious disaster, for example, between 31 December 2000 and 2 January 2001, very serious sandstorms combined with heavy snows resulted in 27 deaths and the lose of 300,000 animals (156,600 dead) in and around Xilinhot City.

However, it seems apparent that the main reasons for the ongoing land degradation remains largely misunderstood. Many people still believe the cause of the land degradation lies solely with climate change such as drought in spring (Qiu, Zeng and Miao 2001; Yang, Fang and Li 1998; Ye, Zhou and Liu 2000) or high temperature in summer (Yan 1990 ; Chang, Liu and Ji 1997; Ding and Dai 1994; Chen, Zhu and Wang 1998; Gao, Pan and Guo 1994). Actually the real reason could be found from the change of livestock over the recent decades(see Fig. 5-4). Surveys carried out within XBR's Hailiute Steppe, confirmed these views with 43% of the herdsmen believing that the degradation was caused by dry climatic conditions. Another 43% regarded both the weather and over-grazing as the main cause of degradation. Only a small group of herdsmen (14%) believed that over-grazing was the sole reason for the degradation. As a result of our research we believe the main cause rests with the increase in populations and the establishment of fixed settlements within the large grassland areas, where many of the people have maintained large livestock numbers without any controls. In XBR, the population has increased by as much as 274 times since 1947 with livestock numbers increasing by 609 times since 1952! It is clear that over-grazing leads to the degradation of the grasslands. The increasing number of sheep and goats is especially disturbing the steppe ecosystem, because their numbers and behaviour have developed into a much more destructive force than larger animals. Meanwhile, the increasing trend of establishing fixed settlements (half of which are Han people from inland China) on the grasslands has further accelerated the over-grazing and degradation, because they want

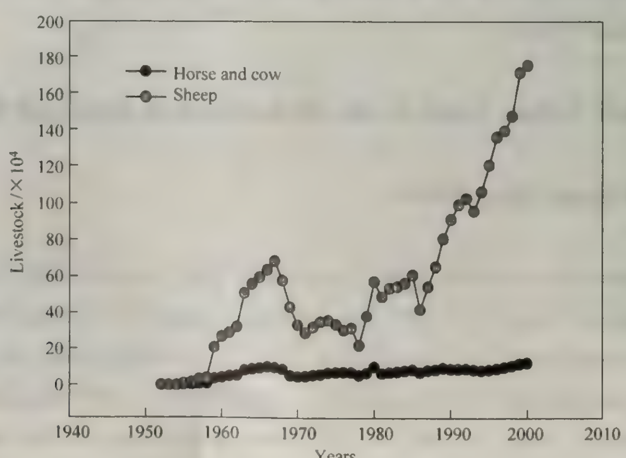

Fig. 5-4 Dynamic of livestock in Xilingol Biosphere Reserve(1950-2000)

more money via exploiting nature in which they believe the grass costs nothing.

As a result, the increases in human and livestock populations and the settlement behaviour are the most important reasons for the degradation of steppe ecosystems in Inner Mongolia. There are many similar reports about the relationship between population increases (Robert 1986; Yan, Deng and Ma 2001; Ware 1997; Rishk 1986; Mahtab and Karim 1992), animals (Skarpe 1991; McNaughton 1990), poverty (Charistainsson 1988; Dasgupta 1992) and land degradation in the world. However, the degradation in Inner Mongolia is so serious that many places of the grassland can hardly support their existing population. To restore the degraded steppe, especially in XBR's core areas, it therefore seems apparent that those people should be resettled from the severely degraded grasslands. The best place for many of these people may be in the cities or small towns within the transition area of XBR.

5.4.2 Restoring the steppe ecosystem by using an urban concept

There are many options for restoring the degraded ecosystem especially if the existing extremely inefficient land use models are replaced by more efficient alternatives, such as intensive cropping and agriculture around the urban areas. The quality of life of the local population would also increase during the urbanization process, especially for the children, or at least the third generation of children, who would have access to educational facilities. The financial problems of these people could be resolved through the careful utilization of the significant funds normally allocated by the government for such areas as, disaster relief, assistance for poor families, combating sandstorms, the prevention and cure of insects and rats, and so on. Since the populations from a previously vast area would be concentrated in and around urban areas, the money could be spent more wisely. And the damages to nature would be significantly reduced with little or no other destructive activities occurring in the nature reserve. Then much larger natural grasses will hopefully return, adding more to nature and the nature reserve, and facilitating the establishment of more reserves in the future. For the existing degraded grasslands, all we can do is let nature run its course by doing nothing (Bradshaw 2000) or simply through fencing off the areas.

It is important to ensure that the option of relying on the urban area to absorb the pressure from the grasslands rests upon an ecologically sound development base. Activities with high land use efficiency should be especially emphasized, for example, intensively cultivating the land, dividing occupations into specialties, developing ecotourism and so on. Furthermore, a series of effective processes need to be well designed for the livestock related and dairy industries in the urban areas, such as for the planting of forage grasses, grass harvesting, forage storage, hay harvesting, livestock breeding, milking, meat and dairy processing, transportation and processing of animal

products. Duplication and internal-competition within the same town should be stopped in order to increase efficiency in production. For XBR, the expanded construction of Xilinhot City and Baiyinxile Town is the key to attract the population from the degraded grasslands.

5.4.3 Expand the core areas

Although Xilingol Biosphere Reserve boasts the largest grassland-type nature reserve in China, its core areas amount to nearly nothing. The core areas in XBR are actually five isolated sites within a vast grassland. Two of them, however, should not be called core areas, because they are not grasslands at all, but include sandy forests, dominated by *Picea koraiensis* and *Popolus davidiana*, with very limited distribution. Even though, the total area for the five sites is only 18. 5 km^2, 0. 17% of XBR. Therefore there is a strong need to expand the existing core areas. It is necessary to incorporate more natural steppe ecosystems especially in Heliute Steppe where the degradation is less severe. However, there are currently 70 households who were recently moved into this area from Baiyinxile and from the neighboring West Wusu Banner (banner is the same level as a county). This steppe is characteristic of the typical steppe dominated by *Stipa grandis*, and is large with an area of 300 km^2. If such an area is included within XBR's core area, then the proportion of core area within the total area of XBR will reach 3%. It will also be necessary to resettle these people, as their current land use efficiency is very low. Poverty remains the main problem and it is feared this could lead to further grassland degradation. In Hailiute Village, we encountered one extremely poor household. The family had 12 members and 10 children (4 boys and 6 girls) with 2 mentally handicapped girls and 5 illiterate members (including the parents). Their current living conditions are very poor and their only familiar way of living is as herders. However, if the grasslands continue to deteriorate they will shortly be unable to make enough money to buy enough food. Furthermore, they lack access to transportation, hospitals, schools, let alone any cultural or entertainment facilities. Sadly, this family is quite typical of other such households on the grasslands. The current actions and behaviour of such families on the grasslands remains largely short-term due to their dire economic situation and their struggle for survival, therefore adding up to quite a destructive element in the ongoing degradation of the steppe ecosystem. These people should be, and in fact expect to be moved out of Hailiute Steppe, so as to make way for the creation of a new core area in XBR. The ideal destination for resettlement would be Baiyinxile Town, just 30 km south. A resettlement plan is currently being investigated and sketched out by the local authorities based on our research suggestions.

CHAPTER 6

RETROSPECTIVE REVIEW OF THE APPROACH TO THE MANAGEMENT SYSTEM IN XILINGOL BIOSPHERE RESERVE

6.1 A Shared Lesson

Xilingol Grassland Biosphere Reserve covers an area of 10,786 km^2, accounting for 5% of the total area of Xilingol League in northern China's Inner Mongolia Autonomous Region. It is the largest of China's 21 world biosphere reserves. The reserve includes many government departments, private enterprises and the city of Xilinhot (population 173,000), which presents a great challenge to its management system. When the reserve was established, whole of the lower reaches of the Xilin River were placed under the jurisdiction of the reserve, so as to protect the entire Xilin River catchment. An important initial goal of the reserve was to integrate the utilization and protection of the grasslands to ensure its sustainable development (see Box 6-1). In retrospect this decision contained a high degree of foresight. This early consideration is in accordance with the biosphere reserve concept and the new trend of integrating nature conservation and regional development, therefore, setting a principle for the reserve to carry out its role of coordinating the development of the local community, economy and ecology.

Box 6-1 Plan of Xilingol Grassland Nature Reserve

The grassland ecosystem in China has been suffering varying degrees of damage. Both the quantity and quality of grassland resources have been steadily decreasing, environmental quality degrading, and flora and fauna resources reducing. These changes have affected the economic development and quality of life on the grasslands. If no action is taken against the current situation, the outcomes will be serious. Hence, effective measures should be adopted to integrate the utilization and protection of the grasslands in order to ensure the sustainable utilization of grassland resources and the sustainable

Continued Box

growth of the local economy. The establishment of the nature reserve is an important step in upholding the protection and reasonable utilization of the grasslands.

(Xilingol Grassland Nature Reserve Plan, 1985)

Human activities during the past hundred years have disrupted the grassland ecosystem in a number of ways and to a varying degree. A relatively balanced and harmonious natural grassland ecosystem no longer exists. The existing grasslands we see are just a remnant of nature, which is suffering from the impact of history and has to endure increasing pressures well beyond the ecological dynamic equilibrium. The population of livestock, insects, rats as well as of humans have been simultaneously increasing sharply, while the quantity of pastures, population of indigenous birds and animals and the productivity of human communities are showing a decline. A number of flora and fauna species are already extinct. Biodiversity on the grasslands has therefore suffered irreversible losses. The structure and function of the grassland ecosystem reveals vulnerability and instability at a space-time level, a species level, a community level and a landscape level. ... What is worse is that the destruction of the grassland landscape, the air and water pollution in grassland cities, land contamination in industrial development zones and overgrazing have not aroused the people's attention. The resulting degradation of the grasslands is instead taken for granted as a natural and social phenomenon or as being inevitable under the impact of social development.

In view of such a reality, we, as protectors of nature, feel obliged to approach and find a solution to this significant environment-survival-development issue by combining traditional ethnic cultures with modern advanced technology under the guidelines of a sustainable development strategy.

(Xilingol Grassland Nature Reserve Plan, 1996—2000)

What we see today is the opposite of what was envisaged in the above plan. The reserve has not escaped significant degradation of the grasslands ecosystem, nor has it avoided regional disasters brought on by natural calamities. Several core areas which are under the strict protection of the reserve account for only 0.17% of the total area of the reserve. They only exist as several isolated islands amongst vast stretches of degraded grasslands. Despite being enclosed by fences, they also have failed to escape from the fate of being sabotaged. A study conducted by Tong Chuan from the University of Inner Mongolia revealed that the area of degraded grasslands caused by overgrazing in the reserve accounts for 81.69% of the total usable grassland area in 1999, a 5.46% increase from 1985 when the reserve was set up. The area of moderately to seriously degraded grasslands grew by 12.79% respectively.

Since its establishment, Xilingol Biosphere Reserve has undergone three great adjustments to its administrative structure. Restrained by various elements, each leadership did their best to improve the administration. In spite of the difficulties, the

reserve's managerial personnel have persisted in taking care of the core areas, monitoring grassland vegetation, and conducting education campaigns among the public. The ingenious decision to establish sisterly friendship reserves with Australia's Bookmark Biosphere Reserve in particular has helped to promote its opening to and exchanges with the outside world (see Box 6-2 and Box 6-3). Yet the results of such difficult work have been challenged by the general state of the ecosystem and biodiversity within the reserve. The fact is that what work has been carried out is still far away from the final goals: the efforts of the past 16 years have neither controlled the aggravated degrading processes which had already begun before the establishment of the reserve nor have they realized the earlier goal of protecting the ecological environment of the lower reaches of the Xilin River. The current grim reality has brought Xilingol Biosphere Reserve to a crossroads, forcing the administration to undertake a policy review to assess the causes of the existing situation and to make a decisive choice for its future.

Box 6-2 Vegetation monitoring and public education

Monitoring: The reserve, in cooperation with the University of Inner Mongolia and the Inner Mongolian Grassland Ecological Research Station (IMGERS) of the Chinese Academy of Sciences, accomplished a substantial number of basic investigations and monitoring work during the early stages after it's establishment. Building on these accomplishments, it published the *Collection of Basic Research Data in Xilingol Nature Reserve of Inner Mongolia*. Since 1994, the reserve staff have independently taken up the monitoring of vegetation, surface water and atmospheric conditions in several core areas, buffer zones and the petroleum development zones. A total of 23,870 data have been obtained and over 500 samples collected. The compilation of the Xilingol Grassland Ecological Monitoring Yearbook, 1994—2001 was based on this data and research. In addition, since 1998 the reserve administration has cooperated with specialists in Japan, a pedologist and zoologist from Japan, in monitoring soils, flora and fauna, with the Inner Mongolian Environmental Protection Monitoring Center in undertaking field interpretations based on remote sensing satellite images. Finally, the reserve has worked with Sonia, a bird expert from Australia's Bookmark Biosphere Reserve, in observing and monitoring birds.

Public education: The reserve receives around 100 special purpose visitors annually. They are from universities, elementary and high schools and research institutes, including students and scholars from Japan, the Republic of Korea, Mongolia and Australia. In 1995, the reserve constructed a 300-square-meter exhibition hall to display flora and fauna samples, photos and related information. For seven years, the exhibition hall has received over 100,000 tourists. To intensify its protection work, the reserve has disseminated among the local community and tourists a large number of "bulletins", "regulations" and colorful pamphlets printed both in Chinese and Mongolian. The reserve has also cooperated with a TV station in producing a feature on the reserve and was designated by the league government as "an educational base" for its role in education over years.

(Courtesy of Dai Qing, Xilingol Biosphere Reserve)

Box 6-3 Xilingol Biosphere Reserve and Australia's Bookmark Biosphere Reserve

In 1995, Xilingol Biosphere Reserve and Australia's Bookmark Biosphere Reserve officially established sister reserve relations. The two sides have since conducted a series of exchanges or visits and training activities, which have not only helped improve the reserve staff's capability and quality but also promoted the exchange of visits between many departments and industries from Xilinhot City and their counterparts in Australia. To date a total of 13 visits have been organized by the 2 reserves. 8 Chinese delegations visited Australia (including 2 for training purposes). The members of the delegations included representatives from the Xilingol League Party Committee, the league government, Municipal Construction Bureau, League Environmental Protection Bureau, Baiyinxile Livestock Farm, IMGERS, the IMAR Environmental Protection Administration, Huayou Oilfield, Power Industry Bureau, Xilinhot municipal government, Public Security Bureau, a water supply company, and Xi'ujimqin Banner Land Resources Administration. The 5 China visits from the Australian side involved staff from Bookmark Reserve, local government officials, experts, farm owners, entrepreneurs and volunteers. The friendly relations between the 2 reserves have greatly promoted exchanges between the 2 regions. The significance of the relationship has far exceeded the original expectations, for instance, in helping to raise the reputations of the 2 reserves within their respective regions, in promoting the cooperative ties between the reserve and many government departments, and in providing a successful example for establishing international friendly biosphere reserves. Xilingol and Bookmark are currently working on further developing these friendly relations and cooperation for the protection and sustainable development of the two regions.

(Courtesy of Miao He, Xilingol Biosphere Reserve)

The deteriorating environment confronts us with a series of questions: Why did the policy centering on the protection of the entire river catchment finally lead to the predicament of having only a few isolated islands? What are the real reasons? What significance do the several protected isolated islands have compared with the surrounding vast stretches of degrading grasslands? What countermeasures should the reserve take to control the situation and what role should it play in safeguarding the safety of the region's ecology and in promoting sustainable development?

These problems present a great challenge to the administration of Xilingol Biosphere Reserve and other relevant government departments. They are also issues that require careful attention by the relevant enterprises and the people within and adjacent to the reserve as well as from those who have suffered from the worsening ecology in the region. If the reserve's original intention of protecting the ecological environment of the Xilin River catchment and of achieving regional sustainable development was just an idea, then the severity of the existing situation informs us that it is now a necessity. It is a lesson not only for the management of the reserve but also for the region and all the departments and people concerned in the region.

Fortunately, the government of Xilingol League has begun to pay more attention to regional ecological protection as well as to the issues confronting Xilingol Biosphere Reserve. A series of crucial decisions were made in 2000, including the establishment of the Xilingol Grassland Nature Reserve Administrative Committee as well as the resettlement of herdsmen so as to expand the core areas of the reserve. Yet how to effectively implement these decisions requires us to carry out an in-depth analysis of the issues and approach to our shared lesson.

6.2 Why Is Xilingol Biosphere Reserve an Isolated Island?

6.2.1 Overuse of the natural resources

Xilingol Biosphere Reserve is under the jurisdiction of Xilinhot City. It includes four farms: Baiyinxile, Madding, Beeline and the northern part of Baiyin Kulun; four communes (townships): Eel Lee, Baryon Wool, Choke Wool and Allusion; a city: Xilinhot; and a town: Baiyinxile. In addition to those businesses located in urban areas, a dozen enterprises including coalmines, quarries, cement plants and tourist resorts are scattered throughout the reserve. More than 80% of the land within the reserve is utilized for animal husbandry, which is the leading industry in the region. Since the establishment of the reserve 16 years ago, the city, town, townships as well as the various industries have attained rapid development, with the population growing from some 100,000 (in 1985) to 173,000 (in 2000); GDP growing from RMB ¥102.83 million(1985) to RMB ¥2.51697 billion (2000) or a 23.5 folds increase, and; livestock numbers have increased from RMB ¥708,675 (1985) to RMB ¥1,921,425 (1999), almost tripling the 1985 figure. The total output value of animal husbandry increased from RMB ¥18.945 million(1985) to RMB ¥244.545 million(2000), with 11 folds increasement(Statistical Bureau of Xilinhot City, 2001). Actually extensive grassland degradation began 16 years ago, with the current area of degraded grasslands within the League reaching 76.23%. The aforementioned rapid development was actually acquired from an already degraded ecosystem, and therefore at the cost of a worsening environment.

The increasingly worsening ecosystem in the reserve has highlighted the severe gaps in our existing understanding and utilization of nature. An analysis of the concept of total economic values (TEV) of nature will probably assist us in determining where we have gone wrong. The total economic value of nature (see Fig. 6-1) includes its use values and non-use values. The use values include direct, indirect and option values while the non-use values include the bequest value and existence value (IUCN, 1998, p. 11). They are also commonly used to define the values of a nature reserve.

Table 6-1 below illustrates the different economic values of a protected area. Safeguarding various values of nature is essential for maintaining the integrity of an ecosystem and enabling it to support and serve its sustainable social and economic development.

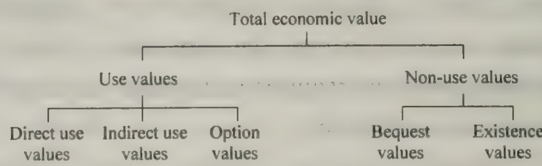

Fig. 6-1 Total economic value

Table 6-1 Total economic values of protected areas

Use values			Non-use values	
Direct use value	Indirect use value	Option value	Bequest value	Existence value
Recreation	Ecosystem services	Future Information	Use and non-use values for legacy	Biodiversity
Sustainable harvesting	Climate Stabilization	Future uses (indirect and direct)		Ritual or spiritual values
Wildlife Harvesting	Flood control			Culture, heritage
Fire-wood	Ground water recharge			Community values
Grazing	Carbon sequestration			Landscape
Agriculture	Habitat			
Gene harvesting	Nutrient retention			
Education	Natural disaster prevention			
Research	Watershed protection Natural service			

IUCN, 1998

The degraded ecosystem of Xilingol Biosphere Reserve clearly reflects such a process: the direct use value of nature has been over exploited, and attention has not been paid to safeguarding the indirect, optional and non-use values of nature. When tapping the direct use values of nature, the local people have over emphasized animal husbandry while neglecting to give play to many other economic values, and, in terms of animal husbandry, the local people have too heavily relied upon traditional herding methods while overlooking inputs into industry. Such over exploitation has finally exceeded the capacity of the grassland ecosystem, and consequently impaired the service function of the ecosystem. As a result, the ecosystem has lost its dynamic equilibrium

under pressure from human activities and natural calamities, resulting in the degradation of the whole natural system, including the degradation of extensive grasslands, i. e. the loss of the grasslands' direct use value. The accompanying deterioration of the ecosystem is resulting in economic recession. It is a common phenomenon in recent years that raising sheep is an unprofitable enterprise. According to our investigations, the economic losses resulting from environmental degradation are estimated to account for 49% of the total expenditure of a moderately well-off herding family, and 27% of the total expenditure of animal husbandry within the reserve. Both the government leaders at various levels and herdsmen within the reserve have now realized that if no countermeasures are adopted, then the pasture and livestock farming industry will disappear before long.

6.2.2 Ineffective protection of public interests

Why have human beings created such problems in their utilization of the region's natural resources? It needs to answer this question. An analysis can be made of the relationship between all the economic values of man and nature and human interests. Generally speaking, the resource users only concerned with the direct use values while showing little interest in the other values of nature, despite enjoying their benefits. For instance, such indirect use values as ecological services, nutrient retention and resistance to natural calamities are usually overlooked. The reason why the users often ignore the importance of these values is that they are common values shared by society and are difficult to translate into goods with a market value. It is quite difficult for the population to be aware of these other values of nature which are associated with the interests of later generations. In order to facilitate the discussions in the following text, all the values of nature have been divided against their corresponding human interests into two categories: individual interests and public interests. The former category (including departmental interests, partial and local interests or personal interests) corresponds to the direct use value of nature, and the latter category corresponds to the indirect use value and non-use value. In this way, we shall analyze the relationship between the values of nature and the beneficiaries.

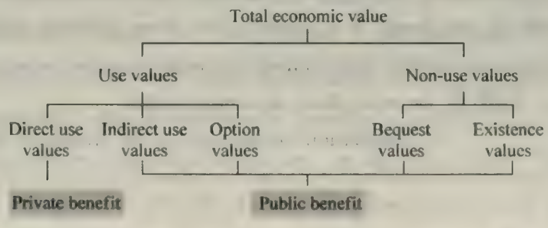

Fig. 6-2 The relationship between values of nature and the beneficiaries

During the development and exploitation of grassland resources, the government's policies considered the public's interests. A household contracting system for both livestock and the pastures began to be implemented in the Xilingol region 12 years ago in order to strengthen the protection of grassland resources while developing animal husbandry (see Box 6-4). In spite of the grassland contract system limiting the number of livestock to protect grassland resources, their numbers have still doubled and redoubled. As a result, the degradation of the grasslands has intensified and the interests of the public have been seriously harmed. This is a typical example where the public's interests are often sacrificed for personal interests.

Box 6-4 Policy concerning household contracting system for livestock and pastures

The policy on the paid use of pastures began to be implemented in 1989, with responsibilities, rights and interest being clearly defined. According to the policy, grassland administration fees are charged according to the number of livestock, and the quantity of livestock farming is determined by the level of grass production. In cases of excessive farming, herders will be ordered to raise the number of animals for sale and pay double administration fees. During the implementation of the policy together with the Implementing Regulations Concerning the Management of the Grasslands, a household contracting system for both livestock and pastures was widely introduced in the animal husbandry sector of the League. According to the rules, each family who signs the contract should establish at least 200 mu (13.33 hm^2) of pasture in 3 to 5 years. They should manage these pastures by means of fertilizer application, seeding, planting trees and irrigation. Starting from the third year, each mu (0.07 hm^2) of pasture should produce 100 kg of dry grass. In instances of failure to reach such a target, the family would be fined one RMB ¥ (US $ 0.12) per mu. This policy of whoever grows the grass and trees will own them shall remain unchanged for a long period of time. Herders are allowed to inherit and sell their products. Grassland-use licenses will be issued for each piece of contracted grassland. ...

Paid contract of the grasslands was based on the Grassland Law and the Regulations on the Management of Grasslands. A contract was signed with a herding family after the following jobs were finished: grassland surveying, demarcation, classification, rating, determination of grass production and grazing capacity, and the fixing of charges. The purpose is to ensure fairness and justice, and to maintain the ecological balance of the grasslands. If the contracted grassland is overgrazed by less than 5%, no compensation fee is collected, and the herding family is allowed to borrow another herder's grasslands. But if the overgrazing rate is between 6-11 %, compensation fee will be charged, 30 RMB ¥ per sheep. If a herder raises more livestock than the prescribed quota but fails to reach the targets for selling their animals and improving the variety of their animals, they have to pay another five RMB ¥ for each sheep as compensation.

(Compilation Committee for the Annals of Xilingol League, 1996)

The Xilingol region has suffered from natural and manmade calamities for three

years running since 1999. After experiencing the full disastrous effects of ecological destruction, many people have now realized the importance of ecological security and the need to base the social and economic development of the region on the ecological environment. Such a healthy ecological environment calls for protection through effective measures. However, this raises the following questions: who should safeguard the values of nature which involve the public interest and what effective measures are available? In fact, Xilingol Biosphere Reserve was established 16 years ago with the goal of protecting the Xilin River catchment and should be granted such responsibility. However, why have the public interests not been effectively protected in an area where a special representative has been instituted to protect these interests? These questions shall be the focus of the following investigation.

6.2.3 The representatives of the public interests lack sufficient input from the public

Safeguarding the public interest requires a representative or an institution of the public interest. In Fig. 6-3, we call these representatives of the public interest conservation managers, and those who use the direct value of nature for their individual interest resources users.

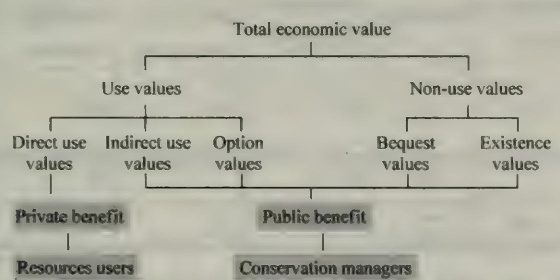

Fig. 6-3 Conservation managers are the representatives of the public interest

Conservation managers should safeguard all the economic values of nature for the benefit of the public interest. Such conservation managers could consist of a committee elected by the local resource users. Such examples can be found in Canada. In most cases, resource users take interest only in certain direct use value of nature. They either neglect or have no ability to spontaneously safeguard the public interest. In this instance, the government needs to designate a special institution to act as the representative of the public interest. Especially when the protection of a region requires regional and state support, the government usually establishes a nature reserve. The majority of China's nature reserves were set up in this way. Whether such nature reserves can uphold the public interest when they perform their duties depends on a variety of conditions, for instances, whether there is enough funding for carrying out

their essential work for safeguarding the public interest, and whether the institutional framework can guarantee the effective implementation of various protection policies. Xilingol Biosphere Reserve has encountered difficulties in both of these areas. The funding issue will be analyzed first.

When it was established in 1985, Xilingol Reserve was a provincial-level nature reserve and was promoted to the national level in 1997. During the past 16 years, the total input it received from various levels of government totaled RMB ¥2.66 million (see Table 6-2), averaging RMB ¥166,000 a year, or just 0.41% of the average annual revenue of RMB ¥40.6976 million within the jurisdiction of Xilinhot City between 1988—2000. The input of the reserve itself from its own income was RMB ¥1.1386 million during the same period. So the funds used for conservation efforts during the past 16 years totaled RMB ¥3.3986 million, averaging RMB ¥212,400 a year, or RMB ¥19.7(US$2.46) per square kilometers a year. This input is just one twentieth of the average annual input for nationwide nature reserves, and one-fortieth of the average annual input for national-level nature reserves (Han 2000).

Table 6-2 Inputs into Xilingol Biosphere Reserve during the past 16 years

Unit: in RMB ¥10,000

	Construction	Salaries	Core area maintenance	Research and monitoring	Other working expenses	Non-management expenses	Total
Input from government	1,100	150	400	100	310	200	2,260
Input from income		626	512.6		90		1,138.6
Total	1,100	776	912.6	100	400	200	3,398.6

Because of the limited financial input from government, the reserve has been working out ways to make profits while conducting their management work, and self-funding has actually been the main priority of their work as the financial input was very low. Although this situation has been gradually improving since the replacement of its leadership in 1999, the reserve is not totally out of the straits. Consequently, it has never broken away from its dual role as both a manager and resource user or in other words as the representative of the public interest and also a stakeholder within the reserve. Up to now, the police substations under the reserve have no regular offices. The salaries for its staff and working expenses are entirely dependent upon its own business operations (see Box 6-5). In such an awkward situation, the reserve, as a representative of the public interest in name, has been unable to strictly perform its duties.

Box 6-5 The establishment of Xilingol Biosphere Reserve Police Substation and its problems

The police substation of Xilingol Biosphere Reserve was established in 1998 with the approval of the government of Xilingol League and the Public Security Bureau of Inner Mongolian Autonomous Region. It is responsible for maintaining social security, protecting the natural resources within the reserve, and for investigating and dealing with instances of damage to the facilities, natural environment and natural resources within the reserve. The police substation is staffed with four people who are selected from the managerial personnel of the reserve and have received police training. Three years after its establishment, the substation has helped to promote the publicity of laws and regulations on nature protection by disseminating over 8,000 copies of publicity materials within the local communities. In the meantime, it has strengthened public order, investigating and handling 28 cases of illegal hunting, collection of medicinal herbs, over-cutting of forests and environmental pollution involving 121 people. They have also handled two public security-related cases, becoming an important force of the reserve administration.

However, all the staff of the police substation are still outside the authorized personnel quota of the reserve administration. Their salaries and operational funds are therefore sourced from the reserve administration's tourism enterprises and from income generated by the sale of entrance tickets. As a result, the payment of their salaries is always delayed. To date, the police substation has no fixed office. Their equipment is extremely simple and crude, even lacking a telescope and a camera which are essential during their work. These have seriously affected their work performance.

(Courtesy of Yan Yun, Xilingol Biosphere Reserve)

6.2.4 Game rules for safeguarding the public interest are not available

The purpose of establishing a nature reserve is to safeguard the public interest. But to safeguard the public interest requires established game rules, i.e. laws and regulations. As social, economic, ecological and cultural backgrounds vary with different nature reserves, the public interest is impaired and threatened by different elements, which are also changing with social and economic development. Laws, regulations, policies and rules formulated in light of the local reality, therefore, provide an essential basis for the manager of the public interest to carry out their routine work. The regulations on nature reserves stipulate that "the major responsibilities of a nature reserve administration are: 1) implementing state laws, regulations, guidelines and polices concerning nature reserves; and 2) formulating various administrative rules and systems to place a nature reserve under unified management."

In Xilingol Biosphere Reserve, there are a number of resource users including livestock farms, coal mines, oil fields, cement factories and brickyards. New industries are growing and developing, for instance, tourism. To deal with so many resource

users, the manager of the public interest needs specific game rules. The existing game rules include a variety of national laws including, the Grassland Law of the People's Republic of China (1985), Environmental Protection Law of the People's Republic of China (1989), Forestry Law (1984), Law on the Protection of Wildlife (1988), Law on Land Administration (1986), and Mineral Resources Law (1986). These laws are too general and lack details to follow when handling specific local problems.

In addition, all the laws and regulations currently in force are applied mainly to some unlawful acts, for example, illegal hunting and harvesting. They lack the corresponding provisions for controlling the destruction of the ecological environment resulting from economic development. For example, grassland degradation is the major issue facing Xilingol reserve. Its causes cover various aspects and there needs to be corresponding measures and rules for each of these causes. However instead, these are almost non-existent (see Fig. 6-4). The provisions of the grassland contracting system adopted by the league government regarding the development of grasslands and obligations for protection have failed to be implemented within the reserve, and no analysis has been made of the reasons causing this failure. This was due to an absence of restraints from specific laws and regulations and ineffective law enforcement that although people have been aware of the importance to control the quantity of livestock, the growth in the number of livestock within the reserve is still out of control.

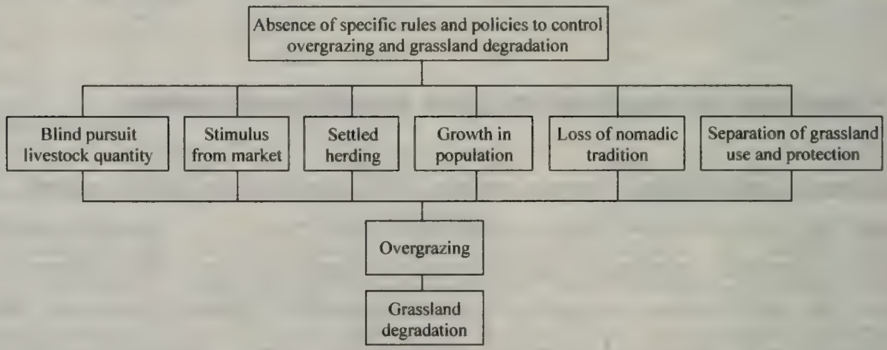

Fig. 6-4 Absence of specific rules and policies to control overgrazing and grassland degradation

With the development of market economy, many new economic activities have been emerging. For instance, the development of tourism has resulted in the emergence of dozens of tourist resorts within the reserve in recent years. But the reserve administration has neither the power nor the corresponding rules to administer them. Some enterprises have used the name of Xilingol Reserve to promote their products without obtaining the permission of the reserve administration nor passing any quality inspection. The reserve administration can only rely upon national laws and regulations to handle any new problems. In many specific and complicated cases, no legal basis is

available. Even the Regulations on the Management of Xilingol Grassland Nature Reserve promulgated in 2001 calling for further revisions to become more specific. After the regulations and rules are adopted, supervision of their enforcement is required, as well as a regular revision of the ecological, social and economic development policies, laws and regulations. However, very little work has been carried out in this regard.

6.2.5 Troubles resulting from land-use rights

For a long time, the reserve administration has been stranded on the issue of land-use rights within the reserve. Land-use rights within the jurisdiction of the reserve belong to four state-owned farms, four townships and a city, while the reserve administration lacks such a right. This makes it very difficult for the administration to manage the reserve. As a result, obtaining the land-use rights is a goal every leader of the administration strives for. After a decade's efforts, the reserve finally obtained a land-use right certificate in one of the eight functional zones (see Table 6-3) and received permission to use the land in six functional zones, but without a land certificate. To obtain the land certificate of another functional zone, so as to be able to use the land in all eight zones is the goal of the existing reserve administration. Even if this goal is achieved, the area of these zones comprises less than 0.3% of the total area of the reserve. Although the reserve administration has been aware that the area and representativeness of these zones are limited, it has no extravagant hope of extending its

Table 6-3 Land-use rights in the core area and transition zone of Xilingol Biosphere Reserve

Functional zones	Established	Area/km^2	Land-use rights
Core area of Qagan Obo Grassland	1985	5.5	Yes, but without a land certificate
Core area of Bayan Wula Huiteng Xile Meadow	To be constructed	5.5	No
Core area of Hailiute Grassland	1985	5.5	Yes, with a land certificate
Core area of Taowuyin Taolegai Remnant Dragon Spruce Forest	1985	1	Yes, but without a land certificate
Core area of Forest of Abu Duertu Mountain Poplar and White Birch	1985	1	Yes, but without a land certificate
Transition zone of degraded Dongtaizi Grassland	1985	5.5	Yes, but without a land certificate
Transition zone of Huanghuagou grass cutting field	1985	5.5	Yes, but without a land certificate
Zhagesitai tourist resort	1999	1	Yes, but without a land certificate

Courtesy of Miao He from the core area administration of Xilingol Biosphere Reserve

administration onto the land it does not have the legal right to use, therefore, deviating from the original goal of protecting the entire catchment and finally resulting in the formation of isolated islands. According to the latest decision of the league government (Document No. 52 [2001]), related departments were ordered to "work out a eco-relocation plan to protect the ecology of the core area, with the goal of resettling all herding families surrounding the core area within one to two years." However during the process, the land-use rights will remain a sensitive issue calling for a sound solution.

The encountering of problems with the land-use rights in Xilingol Biosphere Reserve raises a pertinent issue that we should consider: Is it necessary to recover the land-use rights in order to safeguard the public interest? As a representative of the public interest, the protector and manager of the public interest is responsible for safeguarding the common interests of all resource users instead of simply replacing the interests of resources users. To recover the land-use rights through administrative means has actually encroached on the interests of resources users, therefore intensifying the contradictions between the public and individual interests. In most cases, the ownership of the land-use rights was defined before the establishment of the nature reserve. If necessary and if the right conditions exist, the government should purchase the land-use rights so as to establish a reserve. However, the reality is often that the government at various levels does not have the money because of financial difficulties. Hence, to approach the issue of establishing and administrating a nature reserve on the prerequisite of not changing the ownership of the land-use rights is of immediate concern. In respect to the question of whether it is necessary to recover the land-use rights, the practice in Xilingol Biosphere Reserve has offered a negative answer: The overall degradation of ecology in the reserve makes the efforts of the reserve during the past 16 years to obtain the land-use rights and the results thereof seem wasted. The latest program of the reserve (Xilingol Grassland Nature Reserve Administration 1999) has joined several key core areas and extended them into a core belt of some 4,000 square km. However the attempt to solve the issue of nature preservation on non-public use land is a new subject facing the reserve administration.

6.2.6 Absence of coordination with local social and economic development

Resource users often neglect the maintenance of the ecological environment and biodiversity in their pursuit of economic targets. As a result, nature reserves are established as a solution to the problem. But a nature reserve is apt to overlooking its relations with local social and economic development when stressing protection or when unable to even fend for itself. This is the case with Xilingol Biosphere Reserve.

When they perform their duties on behalf of the public interest, most conservation

managers would be initially challenged by the contradiction and conflict with local development. Protection and development are actually partners. If a conservation manager lacks clear goals or any capacity to solve the apparent contradictions for various reasons, then they are unable to safeguard the public interest and therefore negate their own existence. Many nature reserves have been in such an awkward dilemma. They often pay more attention to strengthening legal construction while neglecting coordination. Actually both aspects are very important. The difference between a world biosphere reserve and other nature reserves lies in the emphasis on coordination for a biosphere reserve's goal is to promote the combination of biodiversity protection and sustainable utilization(UNESCO 2001) . It is also an important reason why a biosphere reserve practices open and adaptable management with the participation of local communities (UNESCO 1995). We may add a background circle to Chart 6-3 to indicate that a biosphere reserve treats man and nature as a whole(see in Fig. 6-5). To maintain the integrity of an ecosystem or a region's natural values it is necessary to harmonize the relationship between man and nature. Harmony between man and nature largely depends on the perfect harmony of individuals and the public interest within the system, that is, harmony between man and nature is achieved through the coordinated coexistence of resource users and protectors. This is also what is emphasized by the concept of ecosystem management approach (UNESCO 2000).

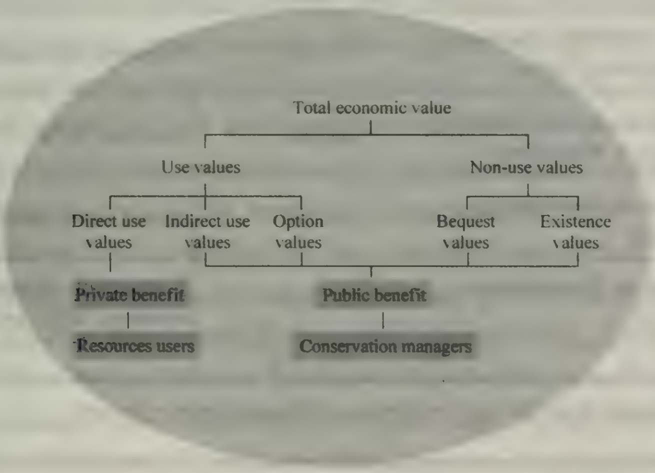

Fig. 6-5 Maintaining the integrity of an ecosystem requires coordination between individuals and the public interest

The fundamental reason behind ecosystem degradation in Xilingol Biosphere Reserve is the lack of coordination between conservation management and social interests or social system, which can be illustrated by the following points:

6.2.6.1 The biosphere reserve focuses narrowly on the management of core areas and has lost control over the buffer and transition zones

Due to a shortage of funds, disputes over the ownership of land-use rights, and an imperfect legal base, the reserve has been forced to focus on the closed management of several core areas, leading to reduced control over the larger buffer and transition zones. These latter areas are home to dynamic human activities, which bring constant threats and damage to the fences. The reserve has to repair these fences once or twice a year (see Table 6-4). During the past 16 years, management within the core areas and the two experimental zones has cost RMB ¥912,600, accounting for 64.6% of total expenditure, while RMB ¥250,000, or the yearly expenditure of the reserve, has been used to repair the fences. Yet years of repair have yielded few fruits. The reserve has to reposition posts each year, which are constantly extracted by local herdsmen. A system is urgently needed to combine resource utilization and protection. People should protect the resources while utilizing them.

Table 6-4 Repair and damage of fences in several core areas and transition zones of the reserves since 1993

Functional Area	Repair Times	Cost of Fencing Materials/¥	Current State
Core area of Qagan Obo Grassland	1		Completely damaged before 1993
Core area of Hailiute Grassland	11	72,100	Damaged and opened to public
Core area of Taowuyin Taolegai Remnant Dragon Spruce Forest	13	47,800	Damaged and opened to public
Core area of Forest of Abu Duertu Mountain Poplar and White Birch	13	42,000	Excellent so far
Experimental zone of degenerating Dongtaizi Grassland	7	39,200	Out of repair since 1999, fence lost
Experimental zone of Huanghuagou Grass Cutting Field	3	53,500	Completely damaged during the spring of 1995, un-repaired
Total	48	255,500	

Courtesy of Yan Yun from the Core Area Division of Xilingol Biosphere Reserve

This research involves a survey conducted among 19 enterprises in the buffer zones or transition zones of the reserve, including livestock farms, factories, mines and tourism enterprises (see Table 6-5). The survey reveals that 63% of the enterprises acknowledge their negative impact on the environment; 79% of the enterprises are not limited or controlled by the reserve; and nearly half of them did not realize they were within the reserve area. This seriously challenges the function of the reserve, which took place 16 years ago and according to the survey, it seems has been seriously divorced from social development.

Table 6-5 Survey conducted among 19 enterprises in the buffer and transition zones

Question	Yes (Number)	No (Number)	Not answered
Do you know whether you are in the reserve area	10	9	
Does your enterprise have any negative impact on the ecological environment	12	7	
Does the reserve bring any limit to your production	4	15	
Does the reserve need to strengthen its management	12	7	
Is there any need to establish a coordinated organization for reserve protection	12	2	5
Is the ecological environment in your area deteriorating	17	1	1
Are you willing to shoulder the responsibility to protect resources while exploiting them	14		5

6.2.6.2 A coordinated system is yet to be established

Up until now, more than 10 enterprises as well as Xilinhot City are developing without a coordinated move to conserve the reserve. In addition, Xilingol Biosphere Reserve, the representative of the public interest, lacks a procedure to solicit advice from resource users in the reserve, let alone to obtain their advice, in their planning work. Uncoordinated development causes major problems to the reserve.

There have been some stories on the coordination: 1) During its initial stage of development, the reserve lacked any specific management organs, except a joint management organization set up by the reserve and Baiyinxile Livestock Farm. This organization maintained a protection station on the grasslands which lasted ten years until 1994 when the reserve established its own administrative bureau (see Box 6-6). Thereafter, the reserve and pastures have encountered greater estrangement and less communication. 2) The Science and Technological Coordinating Team of the reserve was set up after the Chinese National Committee for the Man and Biosphere Program conducted an appraisal of the reserve in 1994. The team invited IMGERS under the Chinese Academy of Sciences and the Inner Mongolia University as its advisory bodies. Yet, due to the ineffective cooperative mechanism and its own difficulties, the team could not fulfill its role. 3) Xilinhot City, with a population of 150,000, is within the Xilingol Biosphere Reserve and the development of the city's energy, building materials, meat production, tourism, entertainment and environment is closely linked with the reserve. Yet the city failed to be officially included in the territory of the reserve for the consideration that the inclusion may pose a difficulty to urban development. This, however, does not put an end to the actual relationship between the

reserve and the city, and their development relationship will gradually become more intimate over time. As Xilinhot City and Xilingol Biosphere Reserve are both major national tourism development areas, the coordination between them is essential. The current situation has revealed that the coordination and cooperation in the region is an arduous task because of the contradictions between the public interest and individual interests, which is an in-depth cause of the many ecological problems in the reserve.

Box 6-6 The joint management organization of Xilingol Biosphere Reserve and Baiyinxile Livestock Farm

In 1985 no special management organ existed when the reserve was first designated, so the reserve and Baiyinxile Livestock Farm jointly set up a management organization. The head of the farm also served as vice-director of the management division of the reserve and director of the production division of the farm served as head of the joint protection station with two full-time personnel. The organization held several meetings per year to discuss its work and received many Chinese and foreign scholars and experts. The farm's personnel who were paid a monthly wage of RMB ¥500 were responsible for the core areas. The organization built a house as the protection station office and purchased a motorcycle and tractor to patrol and maintain the fences. In 1993, the administration of the reserve was set up and the joint organization disintegrated and the office building were bought by the Industrial and Commercial Bureau within Xilinhot City.

(Courtesy of Hao Jun within the Core Area Division of the Xilingol Biosphere Reserve)

Among the 19 enterprises surveyed (see Table 6-5), 90% saw a deteriorating or worsening ecological environment, 74% were willing to protect the ecological environment while exploiting its resources, 63% demanded more intensified management in the reserve, and 63% called for a coordinated protection organization. This highlighted the powerful voice of intensifying coordination between resources use and protection to rescue the worsening ecological environment.

Realizing the significance of the reserve, the local government of Xilingol League set up a Management Committee of the National-level Xilingol Grassland Natural Reserve in August 2001. This committee is to include three deputy league leaders and 14 league bureau heads. The committee aims to better protect the area of the lower reaches of the Xilin River and improve the reserve management system. With its establishment, the contradiction of interests is expected to be dispelled and the reserve will hopefully see the emergence of more coordinated development.

6.2.6.3 Sustainable development lacks specific approaches

Our study shows that local herding and animal husbandry have been heavily affected by drought for the past 3 years and a deteriorating ecology, which also seriously reduced

local income from collecting wild mushrooms and the harvesting of medicinal herbs. Local leaders and people urgently hope for the establishment of a new mode of development since the existing one is unsustainable. With no easy solution, they often place hope on improving weather and have not taken any timely or corrective steps to stop the deterioration of the grasslands.

In Xilingol Biosphere Reserve there are 4 livestock farms, among which, Baiyinxile Livestock Farm, in particular, has a strong technical and grassland resource base and also features extensive animal husbandry. Dozens of holiday resorts have been recently developed to provide almost similar programs without tapping the potential local cultural characteristics. The model livestock farm run by the administration of the reserve has accumulated the experience of maintaining healthy grass silage in summer and providing fresh meat in winter, which not only alleviates the degeneration of the grasslands, but has also been a source of economic benefits. Yet the reserve has not effectively popularized this worthy example for its own benefit. Other positive experiences and practices in the community include the development of Aoqi Nomadic Tourism Resort, which has been developed to explore new way to enhance the capabilities to combat natural disasters, but they need further supervision and support. The brand name of Xilingol Biosphere Reserve, which is utilized by some enterprises in a substandard way, has a great potential value to be further tapped for local sustainable development. The administration of the reserve should make more effort in supporting community development and changing the extensive resource exploitation. The brand name products should be created in the reserve, which embrace economic development and resource protection.

6.2.7 The function of the reserve management bureau deviates from its goal

According to Table 6-5, the administration mainly deals with resource users, with a focus on law enforcement and coordination. Yet they often encounter barriers in their work because of an inadequate system.

Xilingol Biosphere Reserve has constantly improved its management organization. From 1985 to 1994, the reserve had no special management organ and was managed by the Environmental Protection Department of the Urban and Rural Construction of Xilingol League. Without a strong body and imperfect management, it has been unable to carry out its full function. In 1994 the reserve established its own organization, which was responsible for its own revenue and expenditure until the 1999 reforms when the state began to allocate the fund covering the salaries of four employees (see Box 6-7).

Box 6-7 Brief introduction to the development of the management organization of Xilingol Biosphere Reserve

On May 18, 1985, Xilingol Natural Reserve was established by the Inner Mongolia Autonomous Region. The reserve was directed by the Construction and Animal Husbandry departments of the autonomous region and under the jurisdiction of Xilingol League. The Management Division of the reserve was under the League Environmental Protection Department of the Urban and Rural Construction. The director of the department also worked as the director of the division of the reserve, which had a management station and a grassland ecology monitoring station. These two stations were set up under the Production Division and Environmental Protection Monitoring Station of Baiyinxile Livestock Farm.

On March 21, 1994, the Xilingol Municipal Structuring and Staffing Commission approved the establishment of Xilingol Grassland Natural Reserve, a unit with a fixed number of eight personnel under the League Environmental Protection Bureau of the Urban and Rural Construction. The reserve was expected to receive an annual subsidy of RMB ¥15,000 from the prefecture finance bureau, yet the unit did not receive the fund and was responsible for its own revenue and expenditure.

On June 3, 1999, the original Management Division of the reserve dissolved and the Administration was set up which was directed by the vice-director of the League Environmental Protection Bureau of Urban and Rural Construction. The bureau has four full-time staff members and a reception office and production and development office under its leadership. The reserve has to sustain its own expenditure including the workers' salaries.

(Courtesy of Miao He, Xilingol Biosphere Reserve Administration)

As a non-profit institution, the administration mainly involves the activities of scientific research, monitoring and environment-related information publicity and has less say over law enforcement and coordination concerning the preservation of the reserve, due to the unclear nature of the bureau.

To alleviate the severe operational funding shortage, Xilingol Biosphere Reserve set up its own reception division, livestock farm, restaurant, and travel services (see Box 6-8).

Box 6-8 The autonomous business operation and statement of earnings of the Xilingol Biosphere Reserve

Experimental and demonstration pasture: Established in 1988, the pasture was provided by Baiyinxile Livestock Farm to make use of its No. 2 affiliated grassland freely. The pasture was first established with only 4 workers and 280 sheep and eventually developed into a large establishment in 1999 involving 18 workers, 2,000 sheep and 200 cows by way of expanding production and business operations. Furthermore, many facilities have also been constructed including an office building,

Continued Box

dormitories, houses for visiting scholars and experts, a warehouse, a fattening ground, an ensilage cellar, and many livestock sheds. During the period from 1998 to 1999 when the local administrative boundaries were redrawn, part of these facilities were destroyed by the neighboring herders due to a disagreement over the ownership of some grasslands. This action resulted in the suspension of production for some time. Afterwards, due to the gradually dwindling grasslands in Baiyinxile Livestock Farm, the farm recalled all of its grassland from the reserve in 2000. Due to some further reasons, the experimental and exemplary pasture was eventually forced to close.

The Nature Guesthouse: Established in 1986, the guesthouse was first operated by 10 employees, with more than 40 beds. In 1999, the number of employees reached 23, and the number of beds nearly 90. During the past decade, the revenue of the guesthouse has become an important source of income for the reserve administration's employees. However, due to poor management and facilities, the guesthouse's income began to decline in 1997. In 1999, it was on the brink of bankruptcy with an accumulated debt of more than RMB ￥1 million. In the same year, when the reforms to the administration's structural system began, the guesthouse was transferred through a contractual responsibility agreement to the workers. These workers left the administration to operate the guesthouse. According to the agreement, the workers are required to pay an annual charge of RMB ￥200,000 to the reserve administration.

The Nature Teahouse: This restaurant set up in the city of Xilinhot by the reserve began operating in 1995 and was the first restaurant in the city to serve choice lambs, supplied by model pastures within the reserve. At beginning, the Teahouse's business was thriving. However after 1999, it declined in business simply because of poor management. In October of the same year, when the structural reforms were being carried out in the reserve, many staff and workers were retrenched. So the Teahouse was accordingly contracted out to those jobless workers to collectively operate the business. The contractors are required to pay an annual charge of RMB ￥40,000 to the administration of the reserve.

The Tourism Service Center: In 1991, a holiday-resort with Mongolian-style yurts was jointly established by the reserve and the Xilingol Tourism Service. Since 1995, it has been operated solely by the reserve, which injected more investments in the building up of more yurts and toilets, as well as maintaining the roads, constructing water towers, restaurants, an exhibition hall, shops, office buildings, and workers' dormitories. In 1999, it began charging an admission fee. During the past two years, about 20,000 visitors have visited the center. During 1999 when the structural reforms of the reserve were being carried out, the center was transferred from the control of the administrative section of the reserve to the control of the police sub-station on the basis of a self-governing budgetary management. But the four employers should remain on the payroll of the reserve. The center is supposed to be able to make a profit of about RMB ￥80,000 each year. So it is required to pay an annual contractual charge of RMB ￥20,000 to the administration of the reserve, to be used for paying the wages of the personnel of the police sub-station and other operating expenditures.

(Courtesy of Yan Yuan, Xilingol Biosphere Reserve Administration)

Before 1999, the wages of all 50 staff members and workers of Xilingol Biosphere

Reserve were provided by the reserve itself through the revenue from its business operations. About 40 of the workers joined the business operations, with only eight engaged in management, who were also busy all year round accepting visitors and customers. Its principal executives also spent most of their time and energy in this area. In fact, the reserve operated as an enterprise. In the course of a dozen years searching for an approach to sustain itself, even though the financial problems had been partly solved, the figures shown in Table 6-2 indicate that a total of RMB ¥1.1386 million, or an annual average cost of RMB ¥71,000 of the accumulated earnings from its business during the past 16 years had been used for the operation of the reserve. But it was still unable to solve the financial problems at the root of the problem, because it lacked the land-use rights, was poorly managed, and had failed to separate its business activities from its management function. In the end it ended up heavily in debt. In 1999, it had an accumulated debt of RMB ¥1.46 million. Moreover, it also fell into a contradictory dilemma in its conflict of interest with the local community, which greatly decentralized and weakened the protective and management function of the reserve. For these reasons, after 1999, the administration began separating its business entities from its management function. Presently, there are 19 employees working in managerial positions. The wages of 5 of them should be paid by the local (league) government, and the wages of 14 others, including the 4 policemen of the police sub-station, and all the operational funds rely on revenue from the business operations. About a half of these workers are involved in the business component. The administration is still unable to focus its attention on management. Most reserves are able to solve a part of their funding arrangements from their business earnings. However it is necessary to have a certain condition of resources and a perfectly efficient managerial system. The fact that Xilingol Biosphere Reserve has failed to attain its target of seeking an approach to sustain itself in management over the past 10 years, has provided important clues for further analyzing and understanding the management of nature reserves on the basis of self-financing.

In spite of the fact that the reserve administration has made a number of efforts to attempt to solve such a problem, it is yet to commence this role, let alone enforce some key measures or facilitate coordination with other departments, that is to say, it is yet to solve any practical problems. Although there is an administrative body in place to work for the public interest, it has failed to protect such public interests because of its history.

6.3 A New "Common Interest and Responsibility" Managerial System Should Be Instituted

The key to the degradation of the biological system in Xilingol Biosphere Reserve lies in

the failure of dealing with the relations between the public and individual interests. There are many causes for this. All of these causes have interacted with each other to produce a systematic effect. Therefore, adopting a single measure can hardly offer a complete solution to the problems, such as increasing funding or intensifying the enforcement of laws and regulations. It is necessary to introduce a comprehensive policy, or a new system of management. Such a new system should aim at finding solutions at the intersection of both the public and individual interests. We propose to specify the purpose of such a new system, in which the interests and responsibilities be shared by the participants, therefore we have labeled it the "common interest and responsible managerial system". This system is open to the public, allowing any parties to join in the system. The participants can make use of the natural resources in the area while they should protect the area. Corresponding regulations should then be made so long as things develop. It is a managerial system featuring openness, participation, and adaptation. The next section is devoted to studying and discussing such a system.

6.3.1 Integrating the management of the reserve with the development of the local community

During the early stages of the establishment of the reserve, the area defined to protect the entire lower reaches of the Xilin River should be maintained. Despite obstacles existing in the present managerial system, the area should not be reduced or changed. According to the changes in the social, economic and especially ecological developments in the lower reaches of the river over the past decade, it is necessary to definitely specify the area's management goals so as to restore the ecosystem and in the course of restoration promote the sustainable development of the community. If ecological protection was supposed to be the primary goal of the area 16 years ago, then ecological restoration will be undoubtedly the key target for the present. The degradation in Xilingol reserve is so severe that restoration is the only option. In the near future, all the policies and measures of management should be centered on this primary goal, ranging from the protection of small core areas to ecological restoration of the entire area. Such restoration is closely linked in with the social and economic lives and production of the community. As a biosphere reserve, it is important to not only consider the core areas when assessing and monitoring conservation developments but to also include the wider ecosystem of buffer and transition zones. Therefore, the maintenance of sustainable development in the community should also be made one of the important future targets of the reserve's management. Ecosystem rehabilitation and sustainable development, in fact, closely correlate to the future development program of Xilingol League. It is important that the reserve sets an example for the entire

community in restoring the ecology of the region and promoting sustainable development. To realize the goal of combining protection and development not only requires that the local government should take into consideration the reserve as an important "player" on the chess board of the community's development, but also that the reserve administration and the relevant authorities should merge their work with the ecological, social and economic development of the entire community.

6.3.2 The need to introduce a powerful coordinating mechanism

In August 2000, an administrative committee of the reserve under the direct leadership of the league government office was established, consisting of 14 units including the relevant government departments, local governments and industries. The task of the committee has been clearly specified. It shall supervise the implementation of the relevant laws and regulations of the state, coordinate the disputation of conflicts and contradictions, develop policy relating to the resettlement of residents, tourism and development, make proposals for the readjustment of the functional zones, introduce ecological construction projects, and guide the resolution of the existing problems with management. Its duties are specific and essentially cover all the problems and needs of the reserve. The establishment of the committee means that the duty and principal role of the government in the ecological restoration have been confirmed, and the previous gap of a powerful coordinating mechanism has been resolved. This committee will be the core of the new system. We propose that the committee, apart from intensifying its guiding role, should absorb and widely acknowledge the current stakeholders of the areas' natural resources like petroleum, coal, sandstone, brick and tile production, travel agents, and the herding representatives, to gradually establish a broader cooperative and coordinating mechanism involving their common interests and responsibilities. At the same time, this committee should bring the role of the long existing research and educational institutions in the area into full play. It may absorb representatives of such institutions as IMGERS and the Inner Mongolian University to join in the committee and introduce a scientific consultancy system.

6.3.3 A definite orientation for the function and institutional arrangement of the reserve

The experience obtained in the reserve over the past 16 years shows that if the public interest is to be efficiently controlled, then it is necessary to clarify the duties and responsibilities of the representatives of the public interest. This is essential in determining whether the new system can really be established. We propose the

following measures need to be addressed by the reserve authorities and the local government:

(1) It is necessary to transform the present role of the managerial organization of Xilingol Biosphere Reserve into the functional government organization, practicing as a function within government, so as to be included in the government's budgetary program. By doing so, the administration can be relieved from the situation of self-funding and become a genuine representative of the public interest. The bureau, meanwhile, can concurrently assume the task of the daily running of the above-mentioned administrative committee, so as to strengthen the feedback mechanism of policies enacted by the committee, thus bring its functions into full play.

(2) It is necessary to transform the duties and responsibilities of the administration of the reserve from the role of control and protection to one of supervision and coordination. So far as supervision is concerned, the duty of control and protection shall be carried out by those users of the resources in accordance with the relevant regulations, policies, contracts, and agreements. They are required to assume the responsibility of control and protection while sharing the use of the resources. Therefore, the role of control originally played by a managerial organization shall be transformed to other parties, and the organization mainly assumes the duty of supervision, even under such circumstance as it has no right to the ownership of the land. Moreover, only requires a small party of competent personnel, so as to meet the requirements of streamlining the office and promoting efficiency. As for coordination, when it comes into being, the managerial organization should pay special attention to the promotion of sustainable development within the community. In this respect, much coordinating work has to be undertaken, including providing information to local resource users, establishing ties with them, and introducing a participatory and incentive mechanism.

6.3.4 Expanding the core areas should be the main approaches to ecosystem restoration

How to efficiently deter ecological degeneration and restore the local environment has become a common concern for many local residents. Xilingol Biosphere Reserve has adopted some restoration measures, including the reduction of the number of animal, practicing alternatives to herding on the grasslands and grass seeding on fenced sections of seriously degraded grasslands. These measures have been taken for developing animal husbandry, or only for the direct use of developing the grasslands. However, we have to bear in mind the past serious lessons, that it is not possible to simply reap the direct products from nature, but instead we have to stress the importance of restoring and protecting all the values of nature including the ecosystem. We suggest that the

committee and the managerial organization restore the ecosystem step by step beginning with expanding the core areas and cultivating and establishing new industries which tap the potential of sustainable development on the grasslands. This is a long-term maintenance policy for protecting the local interests and the security of the ecosystem, which is based on the following reasons:

(1) The local vegetation is of a diverse biological type and is significant to the world and the nation. Its core areas, such as the Hailiute grassland, boasts typical and high quality grassland vegetation.

(2) Presently, such core areas cover too small an area to protect the numerous biological varieties and the ecological environment. To begin with, the core areas of the Hailiute grassland should be expanded.

(3) One of the purposes of the core areas is to maintain the natural course of development of the ecosystem. Those expanded core areas will fully depend on their natural prosperity to restore the ecosystem. This is the restoring approach with the least cost and the best result.

(4) So far, the vegetation in the core areas and their peripheral areas is yet to be seriously destroyed. So it will be easier to restore them. Expanding the core areas will facilitate the development of new industries, such as a grass-cutting industry and ecotourism.

(5) The approach of firstly expanding the core areas is different from the focusing special attention on those seriously degenerated areas. The latter is, in fact, the traditional way of "firstly destroying it and then redressing it", so called a conventional passive way. And it is liable to lead to a continual degeneration of those still fertile grasslands, because they will bear heavy pressure from feeding more animal. To expand the core areas is a strategy to actively protect and develop the ecosystem, and an inevitable choice to protect the steppe, the historical heritage of nature, and to take on a course of maintaining sustainable development. Of course, such expansion will need to be coordinated with other appropriate measures, such as the reduction of animal numbers, the suspension of the use of herding grasslands, the ecological resettlement of residents, intensive animal raising, and eco-tourism.

The expanded boundaries of the core areas need to be revised and redefined on the basis of including representative and typical grassland areas (Thwaites 1998).

6.3.5 Solving the problem of land rights requires a new way

Protection of the ecosystem and biological diversity of non-publicly owned land is one of the frontier issues. Many countries and regions have worked out corresponding protective policy according to their own circumstances. For example, beginning with

developing regulations and incentive policy, the Australian government has encouraged individual land owners to introduce a variety of approaches to protect biodiversity. Presently, the land policy followed by Xilingol reserve is to grant the ownership of the land to the herders and pastoral ranges for the operation of the land for a couple of decades. The reserve management organizations should emancipate their current mind set, break through the stereotypes and adopt new approaches to expand and control the core areas on the premises of paying attention to and respecting the interest of those who have acquired these land rights. Here, we propose two possible options for expanding the core areas:

(1) Integrate the development of the small towns with the nature reserve. The residents in the expanded core areas of the reserve will be resettled in Baiyinxile town or Xilinhot city with an ecological compensation paid by the local government and they will be organized to join in intensively concentrated production or provided with assistance to find a new job. The ownership of the grasslands will be transferred from these herders to the reserve management. Actually, it is a transfer of ownership with payment, not acquisition without payment. This approach is more suitable for those districts where grasslands have been seriously degenerated, and the local residents are believed to be unable to no longer sustain their livelihood in these areas and are largely willing to move out.

(2) The expanded core areas shall be taken care of by local herdsmen. These herdsmen must give up their past haphazard way of herding. They should gradually turn these areas into zones for sustainable production and operation. During the transition period, the local government through the managerial organization will pay a certain ecological compensation fee for their work. In this way, the owner of the land will not change. The owners of the grasslands will be transformed from users of grasslands into the guardians of the core areas. In fact, it is an effective method of expanding the protective and monitoring role and of sharing the common protective responsibility. Its advantage is to keep the original ownership unchanged so as to maintain a consistency with the policy of the grassland contract responsibility system, which makes the local residents the masters of protecting and controlling the grasslands. This approach can be further integrated with the establishment of grass cutting and collecting ground as well as developing eco-tourism. For instance, such grass cutting and collecting grounds can be set up around the core areas. When the herders living around these areas protect their own grass cutting grounds, it is natural that they also protect at the same time the core areas. We can also draw on the experience of the Aoqi herding village to develop traditional herding folk village tourism. Such tourism sites operated by herders can be established around the core areas. (see Fig. 6-6). These folk custom tourism spots will also be responsible for protecting the core area, thereby integrating ecological protection

with the development of the local residents' livelihood. This program, under the condition of not changing the ownership of the land, is intended for setting up a model of common control over core areas according to the principle of "who uses it will protect it." This principle is of a general significance. This scheme can also be integrated with the scheme of eco-resettling of residents.

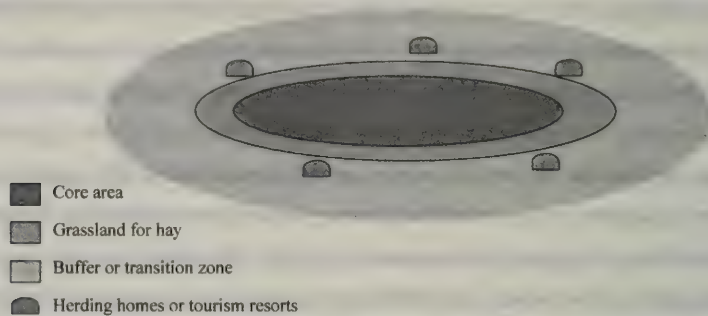

Fig. 6-6 A sketch diagram of the composition of core area guardians, grass cutting grounds, and herders' village tourism sites

The above-mentioned two schemes can reduce the possibility of any contradictions with the land owners when they join in the protective and control activities. During the period of restoration, they can also promote the development of new industries. For the present, it is necessary to introduce such schemes, since the conditions are favorable for implementation. 1) To expand the core areas in the reserve should result in the positive restoration, which is in line with the state's ecological restoration program currently being implemented in the degraded arid regions. The required funds can be drawn from this fund for restoration. 2) When the majority of the herders and cadres are conscious of the urgency of the ecological restoration, these schemes should gain their support. 3) These ecological restoration schemes can be carried out with a minimal cost. 4) People are positive about expanding into new sustainable industries. 5) The formation of the new protective and developing model of "sharing the common interest and responsibility" is of long-term significance to the entire region.

6.3.6 Strengthen legislation

The broad and complex project of protecting the ecosystem and biodiversity of the lower reaches of the Xilin River is interconnected with the interests of many stakeholders. Any regulations, policies, rules, and systems can be efficiently carried out only when they are specifically elaborated in detail. For example, the reserve management administration should control the following issues according to detailed and explicit regulations and policies: the rights, interests and protective duty of the grassland

owners; the duties of protecting the environment by the tourism operators; the principles on which the control of land in the core areas will be based; the regulations on the supervision and reward and penalty for the performance of various industries in the reserve; and the formulating and implementing of any incentive policy for sustainably developing industries. With complete and perfect regulations and policies, the resource users should be required to implement their protective duty efficiently and management in the reserve can be transformed from a previous passive state into a supervisory state in accordance with the laws.

6.3.7 An institution for a system of comprehensive planning

Comprehensive planning is an important means of balancing and regulating protection and development. The development plan of every enterprise, community, city and town should be included in the comprehensive planning. Furthermore, each stakeholder should develop his own plan within a comprehensive regional framework. With its full authority and the status of coordinator, the reserve management committee will be the ideal leader of the work. Therefore, the drawing up, implementation and appraisal of an overall planning program should be incorporated into the important business of the committee. The overall planning program is also a process based on participation and regulation to ensure that the overall planning program will be a centralized presentation of the common interests and responsibilities of the various stakeholders. Many reserves have set up coordinated management organizations, but these organizations have often failed. This often has more to do with these organizations lacking an overall planning program or a linkage with such a system. A comprehensive planning program is either a means for the management organization to carry out coordination and regulation, or a guiding principle by which it will carry out its monitoring and supervising role.

6.4 Some Food for Thought

Since the 1970s, nature reserves have rapidly developed throughout the world. Furthermore, the expansion and management of these nature reserves has become more complicated than ever before. The experience of Xilingol reserve has brought us much enlightenment far beyond our traditional knowledge and understanding about a nature reserve. This reserve has gone beyond the limits of the managerial affairs of the area. From our analysis and conclusions, it is necessary to consider a few issues:

(1) The real challenges that reserves are confronted with exist in the managerial process after a reserve has been established. Xilingol reserve has been established for 16 years now. During these years, the state and the community have seen enormous social

and economic changes. However, the reserve has failed to work out an appropriate managerial policy corresponding to such rapid changes let alone generate adequate funding to ensure its subsistence existence. As a result it has been unable to effectively fulfill its intended role. Is Xilingol an exception or a general phenomenon? The Xilingol reserve is a national-level nature reserve, and it is also a world biosphere reserve. Therefore what should the relevant government departments and concerned organizations do to improve the existing situation?

(2) The reserve is closely related with the social, economic and ecological developments of the community where it is located. That is to say, the development of the community will fail to maintain its ecological security if it is separated from the reserve, while the reserve will inevitably continue to be an "isolated island" if it is unable to bridge the gap that exists with the local community. The protection of biodiversity and the realization of sustainable development have challenged the existing management system that separates protection from development. Nothing shall be achieved if there are no breakthroughs made in the managerial system. After the completion of the current study, we have been confronted by a number of problems. Firstly, can our proposal for a new organizational system be carried out? Or in other words, how do we introduce a pioneering organizational system? Secondly, where does the initiative of a new system come from? Does it come from the government or from the managerial personnel of the reserve or the local community?

(3) In those arid regions where the ecological environment is fragile and degenerated, expanding the core areas or establishing new nature reserves is regarded as an important means and approach of maintaining and restoring the ecological environment and economic development within the area. At present, a number of regions have followed a practice of suspending the use of herding grounds for a period of time or closing down the grounds all together, which is believed to be actually a form of protection by a reserve. Such protection can only effectively take place with the participation and control of the communities. Based on such a belief and the preconditions of protecting and restoring the ecological environment, the communities can achieve sustainable approaches to regenerate their economy so as to promote local development. Though this approach is yet to be verified by successful experience, it is a way of thinking which we have learned from our past lessons. This concept is also the basis of the ideas and reasoning of the world biosphere reserve program. Will such reserves that have been confronted with the same problems as the lower reaches of the Xilin River, take into consideration the establishment of a reserve as an important means to maintain the sustainable economic development of the community? Is it possible to further integrate all of these reserves into an ecological shelter and development base? Is it a useful suggestion or idea for the development of western China?

(4) When policy makers are planning to establish reserves in ecological restoration areas, they should consider the restoration, protection and the long-term development of such areas as a whole for the region. Moreover, while suspending or closing-off grazing in these devastated districts, policy makers should consider the selection of some districts where the ecological environment remains comparatively intact as core areas to be protected, otherwise these significant areas will also end up devastated. It is important to prioritize the establishment of reserves as early as possible rather than after the environment has been totally devastated. This will ensure the preservation of any remnant pockets of biodiversity but also reduce the costs involved. In fact, it is a way to let the areas where the ecological environment remains intact to learn a lesson from those poorly operated areas in advance, avoiding a repetition of the latter's unsuccessful practice. At a time when we are launching a drive to redress and rebuild the ecological environment in many devastated areas, is it more important to protect those areas where the ecological environment remains intact with much less cost than to protect them through any other way?

(5) The management of grassland nature reserves should be focused on their ecological, social and economic situation and the characteristics of their animal husbandry industry and production. Controls on herding and grass cutting in the core areas should be considered so as to maintain a balance between the structure of the ecosystem and its function as already much wildlife has already vanished and more are threatened. When serious natural calamities strike, these areas will reveal their natural dynamic ability to survive. Xilingol Biosphere Reserve has inevitably reduced itself to an "isolated island" over the past 16 years only because it stuck to the principle of allowing no human interference within the core area. This phenomenon has once more raised such a question: Is it possible to immediately introduce a management practice according to different classifications of nature reserves, together with the publication of corresponding regulations and policies?

CHAPTER 7

COORDINATING THE MANAGEMENT OF XILINGOL BIOSPHERE RESERVE

7.1 Introduction

The purpose of this paper is to introduce some preliminary suggestions for improving the coordinated management of Xilingol Biosphere Reserve and its surrounding grasslands. The location, size and significance of the grassland nature reserve have already been clearly highlighted elsewhere in this report by Chen, Tong, Li et al. However, it is important to introduce the core issues at stake as well as the main players in this complex equation. The main government stakeholders include: the Central Government, the Inner Mongolian Autonomous Region Government, the Xilingol League Administration, the Nature Reserve Management Bureau, Baiyinxile Livestock Farm, the Communist Party, the relevant banner leaders as well as the league and city level ministries of Agriculture, Animal Husbandry, Environmental Protection, Land Administration, Public Security, Finance, Tourism, Urban Construction, Forestry and the Inner Mongolian Grasslands Ecological Research Station (IMGERS). It is hoped that this current definition of stakeholders will eventually be expanded to include the herding families within Xilingol Biosphere Reserve. Despite many reservations about their ability to enact change, the herders hold the key to the resolution of the degradation of the grasslands. There are two fundamental realities that all the stakeholders need to acknowledge before it will be possible to tackle the degradation of the grasslands in question. All the key players need to not only acknowledge the existence of the current crisis facing the grasslands but also identify the real causes of its occurrence. Moreover each stakeholder must realise the implications of the long term effects of environmental degradation and take responsibility for the long-term conservation of the grasslands in order to guarantee its ecological continuity. Without due consideration of these issues by all the stakeholders, attempts to reduce the degradation and commence the restoration of the grasslands will remain a struggle.

It is not surprising that questions still remain as to the real causes of the degradation of the grasslands and it would be fair to say that some stakeholders could be forgiven for believing that some of the causes are simply natural anomalies, a result of a short-term trend due to unfavourable climatic conditions or a recent influx in the herding population of livestock. However, it would also be fair to say that these same people are clearly not interested in taking any responsibility for the current degradation. For over 20 years now, grassland researchers and some managers have been highlighting the gradual deterioration in the fertility of the grasslands. The same people have been calling for action to curb the ongoing degradation, however their voices have been silenced by the calls for increased production and economic growth. This is not just an overnight phenomenon, but rather, one that has slowly taken shape over a number of years. Only those with little or no interest in the health of the grasslands, who are ignorant of the essential role of the environment or who had limited time in the area would fail to appreciate and understand the issues at hand. As noted by Chen and Tong in this report, the degradation of the Xilingol grasslands was gradual in its early stages, however the speed and extent has dramatically accelerated over the last decade. This degradation has already caused irreversible damage to some sections of the grasslands, where restoration seems impossible in the short-term. For many other areas, it may be possible to reverse or at least stabilise this degradation. However, it is important to appreciate the fact that this will not happen overnight. The restoration of the grasslands may very well take over twenty years or more to eventuate.

The concept of an 'ecosystem' while seemingly self-evident provides a bridge between the current degradation and an understanding of where the current responsibility lies. To fully appreciate the meaning of an ecosystem here is to appreciate the relations and inter-relationships of the environment and the negative impact of the activities in and around the grasslands and the long-term health of these grasslands. As might be expected some of the forces at work are positive and some are negative, some are direct while others are in-direct. Therefore it is important to look beyond the growing population of livestock and humans, the current grazing patterns, the herding families and livestock farms and begin to understand that the grasslands are not an isolated island, but rather, part of a dynamic ecosystem, which stretches well beyond the administrative boundaries of Xilingol League. To clarify this point, the article by Jiang in this report, stresses the significance of linking the development and health of Xilinhot City with its surrounding environs. In another article, Han notes the importance of understanding and valuing the ecosystem as not just a resource to exploit but rather an essential part of Xilingol's development equation. On the negative side, there is the obvious example of the increasing intensity, size and frequency of sandstorms originating from the Xilingol region. These sandstorms not only strip the

grasslands of important top soil and leave the ground barren, they are also impacting upon the economy and health of neighbouring regions, most notably Beijing and Tianjin. Similar problems can be found further a field on the Korean Peninsula and Japan. Satellite imagery and soil testing have shown that these sandstorms have even travelled as far as North America. These events are definitely not something to celebrate. With the occurrence of new sandstorms it becomes evident that the restoration of the grasslands is becoming ever more distant and difficult to fulfil. Less obvious, but perhaps more pressing, is the extinction of the flora and fauna inhabiting the grasslands. The impact of this crisis on the biodiversity of the grasslands is still largely unknown, but early signs paint a bleak picture for the future of the region's indigenous flora and fauna.

Through an acknowledgement of the existence of a grassland ecosystem, especially one that goes well beyond administrative boundaries or traditionally perceived systems of responsibility, a new picture of responsibility should eventually emerge. Central to solving or at least alleviating the problems in the Xilingol area is the administrative government and various departments located in Xilingol League who need to take central responsibility and could be instrumental in establishing a coordinated approach to combating the crisis. However, responsibility does not solely rest with these stakeholders, it stretches to China's capital, Beijing. The central government has acknowledged some of this responsibility with the launching of various campaigns offering funding and technical support. During the past decade Beijing has increasingly placed more emphasis on improving the protection of its fragile and unique environment. This is highly commendable. However, the central government is constrained by what it can effectively implement due to the past two decades of reforms resulting in the decentralisation of power and authority to the lower levels of government. Therefore, the central government needs to exercise a role where it is most appropriate, notably with technical and financial support and political guidance. However, this role does not just end there. Beijing needs to ensure that this support is channelled in the most efficient and effective way. The central government is in a favourable position to be informed of relevant domestic and international advances in offering potential solutions to the challenges faced in Xilingol.

The other distinguished authors of this report have pointed out the main causes of the current state of grassland degradation as well as having raised a number of potential short-term and long-term options and strategies for alleviating or at least combating this degradation. All of these suggestions need to be carefully considered by the authorities and stakeholders of the grasslands. However, it is necessary to concurrently re-evaluate the existing management structure, the functionality and efficiency of the organisations involved and the relationships between the various stakeholders. Only then will it be

possible to realise the restoration of Xilingol's grasslands. Currently, there is very little coordination of activities between the stakeholders, let alone an appreciation of who the stakeholders are nor of the need to widely consult amongst and between them. The cause of this lack in communication and cooperation is to a large extent a by-product of China's bureaucratic organisational framework. The current bureaucratic organisational system has entrenched a closed and restricted approach which conflicts with the ecosystem approach. Each department is confined to the limits of its own jurisdiction and authority. What communication and cooperation that exists between departments is either a result of either strong local government pressure, an appreciation of mutual interests or the close personal relationships between the leaders. There is a clear need for greater communication and exchange between the different regions. Mutual interest in this context needs further clarification and elaboration as "mutual interest" typically involves the provision of immediate economic or political benefits to both parties rather than a sustainable long-term relationship. Once the "mutual" economic or political benefits are exhausted, the relationship usually dissolves. Therefore, if the current bureaucratic system is going to be reformed, then it is necessary to go beyond the existing decision-making process and ideology to further strengthen environmental protection with long term sustainability in mind. Presently and no doubt for many years to come, environmental issues will continue to be dominated by economic concerns. It is therefore appropriate that this report emphasises the utilization of alternative economic mechanisms to reduce the degradation and increase the preservation of the grasslands. Without positive economic benefits, most suggestions will receive little attention from the authorities, let alone the herders. Many of these herders are preoccupied with the daily struggle to sustain their existence from the grasslands. To a large extent it is the economic pressures which drive them to extract as much short-term benefits from the grasslands, regardless of the long-term degradation. If the suggestions from this report are to be taken seriously, then they must address the basic issue of feeding the very people whose livelihood is so much at stake with the environment and its degradation.

The following recommendations are somewhat vague suggestions and probably reflect my limited understanding of the complex situation currently prevailing in XBR. My understanding of the situation presented in this paper is based on two field trips to the region in 2000, informal interviews with local residents as well as a modest reading of the available literature on the subject. These recommendations are only preliminary at the very least and as is clearly evident, much more needs to be researched and understood before a clear framework of solutions can be developed. It is beyond dispute that solutions need to be found now and immediately acted upon. Nonetheless it is important that whatever framework is finally adopted, it should remain flexible enough to adapt to changing circumstances and conditions, rather than be seen as a complete

recipe for the rehabilitation of the grasslands and the development of the region. The purpose of this paper is to reflect upon some of the most obvious problems that need attention. However, it should be said that this is a work in progress and that it is possible that some of the interpretations and suggestions could be somewhat skewed or even quite possibly inappropriate. If so, all the responsibility rests with the author of this paper.

The following suggestions have been grouped according to eight imprecise topics: management, economy, ecotourism, science and monitoring, land reform, the management bureau, nature reserve boundaries and finally some general concerns. This grouping in no way ranks these topics according to significance or priority, but rather helps to clarify some of the primary determinants that this paper attempts to identify and address. Once again, it should be acknowledged that these reflections are in no way complete. They reflect only a fragment of a very complex scenario.

7.2 The Aspects Needed to Be Managed Further

7.2.1 Management

The creation of the nature reserve management committee by the deputy secretary of League Party Committee and deputy director of the Government's Standing Committee, Su He in August 2001 should be fully supported and highly commended. This is a fundamental step forward for ensuring a more integrated and coordinated approach to managing Xilingol's grasslands and addressing some of the serious issues facing the nature reserve's management bureau. However, it is essential that this committee is utilized as an open forum for the genuine debate of the issues at stake. It should also provide an opportunity to disseminate new ideas and strategies for tackling the degradation. The committee should also draw up a coordinated master plan of the necessary measures required by the various stakeholders to reverse their current negative actions, stimulate more positive activities and increase the complementarity of programmes. Furthermore, a coordinated management committee would also be in a stronger position to call upon the technical and financial assistance of both the central government as well as international agencies. Much responsibility rests with the success of this committee and it is hoped that the participating members appreciate the urgency and significance of their role, as well as the possibility of leading the way in the restoration of the grasslands throughout the rest of China. Xilingol's grasslands are just one part of the whole equation. It is therefore important for Xilingol to demonstrate to the rest of China what is possible and to prove that through coordination and rational sustainable management, the health and prosperity of the grasslands can be fully

realised.

(1) Ensure a stable political and financial commitment from the local government for conservation work.

(2) The higher levels of government need to encourage the lower levels to communicate and negotiate with each other as well as directly with the nature reserve regarding the management of the grasslands through the establishment of bilateral dialogue channels.

(3) Increase transparency by ensuring that all stakeholders communicate their key priorities in each area and clearly state what necessary concrete action is required to fulfil these priorities.

(4) The League government should develop a grassland management plan in consultation with the other stakeholders as a guiding policy for all other departments to follow. This management plan should incorporate both economic and biodiversity interests.

(5) Strongly support the newly established nature reserve management committee and closely follow its developments to determine whether the committee operates according to its original intentions.

(6) Encourage ongoing communication with herding families to ensure their understanding of potential reforms and their compliance with the relevant regulations.

(7) Carry out independent reviews of the level of communication between the government and herding families to ensure a more open and accountable management approach.

7.2.2 Economy

(1) Directly link the development of Xilinhot City with the rehabilitation of the grasslands. The healthy development of the grasslands relies upon healthy grasslands.

(2) Develop an economic mechanism which would compensate herding families for loss as a result of conserving their land, thus reducing the pressure on their survival and on the grasslands. The United States, Canada and Australia have all adopted such economic mechanisms to protect parts of the environment from exploitation and it would be beneficial for Xilingol League to study these and incorporate appropriate measures from such strategies. Furthermore, the State Forestry Administration, the Ministry of Finance, Renming University of China, the Rural Development Institute and the World Bank have launched a number of studies throughout China relating to natural resource management, conservation and land tenure issues. These studies should be investigated to see if their results and proposals are applicable to the grasslands of Xilingol League.

(3) Incorporate Xilingol's strategy for rehabilitating the grasslands into the

national strategies to ensure long term political, administrative and financial support.

(4) Investigate other channels for funding from both domestic and international sources to continue to research the grasslands and preserve the biodiversity of Xilingol's representative grasslands.

(5) Carry out an assessment of the ecological value provided by the grasslands. This work should be carried out in cooperation between IMGERS and interested universities.

(6) Offer short term, low interest loans to herding families who express an interest in either developing alternative, low-impact activities on the grasslands, or diversifying their current economic activities beyond just grazing livestock on the grasslands. See also eco-tourism.

7.2.3 Ecotourism

(1) The tourism bureau should work with the League government and other relevant departments to develop a plan to incorporate the local herding families into ecotourism.

(2) Herding families should be given a high presence in tourism developments, and they should be provided with training to act as tourist guides and operators where appropriate.

(3) The Tourism Bureau, with the endorsement from the League government, should commence an educational campaign with local producers of dairy products and other by-products to ensure their support. This may come in the form of endorsement or their ability to utilize the Biosphere Reserve's name in their product promotion and advertising. Organize a conference for manufacturers and industry to determine the level of support for such a program.

(4) Establish a training course in Xilinhot for herding families interested in developing ecotourism activities. The course should cover all the different aspects of setting up such an enterprise and making it successful with the least impact on the environment.

(5) Offer small, low-interest loans to herding families interested in developing ecotourism as an alternative or supplementary income source. These loans should go directly towards the costs of offering attractions to tourists or attendance at the above mentioned subsidised training courses on ecotourism.

7.2.4 Science and monitoring

(1) Further strengthen the relationship between the Inner Mongolian Grasslands Ecological Research Station and the nature reserve management bureau.

(2) IMGERS should be represented on the nature reserve management committee or at least one scientific personnel to ensure adequate understanding of the problems and causes of the existing degradation.

(3) Carry out an ecosystem survey and analysis of the grasslands and preparatory work for targeting significant conservation areas to be utilised by the nature reserve management bureau for collaboration with herding families.

(4) Research the applicability of both domestic and international models and mechanisms for the sustainable utilisation of grasslands, as well as models for the coordinated management of grassland resources.

(5) Foster and build upon existing domestic and international relationships.

(6) Carry out year-round research and monitoring of the grasslands.

(7) Assess the biodiversity of the grasslands and develop a strategy to protect the significant representative areas of biodiversity (in partnership between IMGERS and Inner Mongolian universities) for developing a specific biodiversity action plan.

(8) IMGERS needs to develop a greater emphasis on social science and environmental impact in their research. It seems that most of their research remains focused on developing greater artificial grasslands that will increase income and reduce degradation, however the quality of the grasslands is not the cause of the degradation. Also it is useless suggesting a carrying capacity for the land, as this cap would need to be flexible enough to incorporate all the different environments within XBR and also take account of different herders grazing habits and management, not to mention climatic variations. Instead, the station should widen its focus on researching and developing alternative economic mechanisms for herders to survive.

(9) Assist the local herding families in improving grazing behaviour and management.

(10) Research the indigenous grass species for possible alternative products such as grain, medicinal and forage. Are you suggesting the introduction of other species or are you suggesting that indigenous species should be used instead of grain and forage.

(11) Monitor the existing artificial grasslands as well as the implementation of new grass species and artificial grasslands to ensure they do not affect the genetic species of existing grass species. Monitoring is not going to prevent cross-breeding or encroachment.

7.2.5 Land reform

The current land tenure arrangements seem to only accelerate degradation. New approaches need to be found to provide incentives to the herders to conserve their land in the long term. Possible options that need to be considered, include:

(1) Secure access and utilisation of land tenure rights.

(2) Privatise the land.

(3) Issue shorter contracts with renewal subject to conditions and track record.

(4) Issue 50-year contracts with a caveat on conserving the grass and land.

(5) Reduce the level of redistribution to ensure herders feel a certain degree of stability.

(6) Provide the herders with choices and independence regarding use of the land through potential changes to title.

(7) Include a caveat on some land for the purpose of conservation, but provide appropriate compensation.

7.2.6 Nature reserve management system reform

(1) Quickly carry out the necessary institutional reforms for making the Nature Reserve Management Bureau directly and clearly responsible to the newly formed League Environmental Protection Bureau.

(2) Establish the key priorities in each area of the bureau's work and clearly state what necessary concrete action is required and include what this action is reliant upon. This information shóuld be supplied to the Nature Reserve Management Committee without delay.

(3) The director of the Nature Reserve Management Bureau should not hold two concurrent posts as currently exists.

(4) Carry out year-round management of the nature reserve. Winter often witnesses the greatest level of degradation of the grasslands. Furthermore, winter is a good time to engage the local herding families in discussions about joint-management.

(5) Immediately resolve the problems relating to the public security sub-station. Relocate this station to Baiyinxile either under the authority of the League Environmental Protection Bureau or under the League PSB, as part of the Baiyinxile police station. The latter option is preferable as it would ensure clear lines of authority and responsibility as well as fostering better communication with the local police and their contacts. This option could see two full-time officers allocated to this station to work with the local herding families, commune farms and Baiyinxile livestock farms and its enterprises. During the warmer months they would work closely with the nature reserve management bureau and assist them at their Zakstai station.

7.2.7 Expand nature reserve's boundaries

Expand the current boundaries of the core areas to include at least half or all of the

neighbouring herding families' land or, if necessary, and where there is high degradation, consider resettlement (but only as a last resort) and compensation. These herders should then sign a contract with the nature reserve management bureau and the government to compensate them for their conservation and surveillance work. This sum should be worked out in according with the above economic mechanism but also relative to the biodiversity of the relevant area and the level of commitment they are willing to make. The contract could allow them greater access to hay and shelter during the colder months. There may be a need to offer low interest loans to some of these herding families as an incentive, but also as a guarantee that they will be able to cope with the first two years of reduced income as a result of a reduction in the livestock numbers. Such a program would require the following measures:

(1) Launch an education campaign to inform the herding families of the cause and effect of such a program.

(2) Develop trust and communication between the herding families and the nature reserve management bureau.

(3) Consider offering signed and pledged contracts with upfront payment of conservation funds.

7.2.8 Concerns

I have a number of issues that I believe need to be addressed before any of the above action can be taken. Much of these concerns are related to the need for the nature reserve management bureau to start taking responsibility for their work within their limited capacity.

(1) The conflict over the contradiction of benefits is not a serious problem. The cause is primarily due to the absence of a coordinated planning approach by various departments. These departments are yet to follow a coordinated development approach.

(2) Lack of confidence in the commitment of government departments in immediately tackling the problem of grassland degradation. Many officials are aware of the degradation but are not willing to accept responsibility for creating the situation: citing climatic causes, suggesting that it was a neighbours problem or that it lay outside their authority and jurisdiction. If these attitudes continue to prevail then no grasslands will remain for them to manage.

(3) In many instances the core areas of the nature reserve face just as severe degradation as the surrounding areas and in some instances more serious degradation. Some of the responsibility for this degradation rests with the nature reserve management bureau. If they are unable to demonstrate that they can sustainably manage the grasslands for conservation purposes, then no one will be willing to expand the core

areas or effectively transfer control over to the management bureau. This bureau needs to explore different avenues for improve their own management effectiveness despite their difficult circumstances. This is no simple matter and requires other fundamental changes, but without their own efforts there will be little or no opportunity for the conservation of important and representative grasslands.

(4) Unless the morale of the nature reserve management bureau is lifted they will be unable to effectively carry out their work. This is not a simple matter, but they still have a number of means within their grasp to implement their work either solely or in collaboration with other departments, livestock farms and herding families.

(5) Without developing some basic concrete plans of their work, the nature reserve management bureau will not be taken seriously.

(6) The current situation is impossible to accurately measure in our own mind. The problem is fundamentally a human problem of poor relations and cooperation between the various stakeholders. Therefore, much of the responsibility rests with the authorities to improve these relations.

7.3 Discussion

Despite the wishes of many there are no quick fix solutions to this crisis. The grasslands will not return to the 'golden days' tomorrow and the sandstorms are not going to disappear overnight. The stabilization of the degradation and the restoration of the grasslands will be gradual and piecemeal. However, none of this will happen unless the authorities reassess their current activities and ideas about the utilization of the grasslands as a resource. A coordinated and integrated approach on behalf of the various government departments is required. This approach also needs to be open and adaptive to have a long-term effect on slowing the current speed and intensity of degradation. Furthermore, beyond improving the current management system, it is necessary to broaden the current understanding of how to deal with the crisis. The conservation of the grasslands will not take place unless the inter-personal relations can be improved to stimulate trust, understanding and cooperation. New and dynamic ideas, mechanisms and approaches have to be considered and implemented. By developing the existing strengths and overcoming the weaknesses of the situation, not only will the grasslands of Xilingol prosper but also will the people and the region. It is essential that the current leaders utilize this significant opportunity to improve management and coordination so as to ensure that future generations will be able to share in the wealth and health of the Xilingol grasslands.

CHAPTER 8

INTEGRATION OF CONSERVATION WITH DEVELOPMENT THROUGH XILINGOL BIOSPHERE RESERVE*

This research has been based on the study of an area of grassland in Inner Mongolia, China. The area under study is a biosphere reserve, which has a range of objectives including the conservation of biodiversity, and the fostering of ecologically and culturally sustainable economic development for local people. The grassland within the biosphere reserve is currently managed by a number of state and collective farms, which have the authority to plan their own land use activities to meet the economic objectives and priorities established by higher levels of the Communist party of China. The objective of these farms is to develop the animal husbandry industry to provide livestock products to markets and provide wealth for local people. Despite legal authority provided by the National Nature Reserve Regulations, in reality, the biosphere reserve has no authority over the farms in relation to land and resource use activities.

Grazing practices being followed are currently unsustainable. Degradation is occurring across the grassland, being very severe in heavily grazed areas such as around villages and water points. This degradation threatens the future of the grazing industry, as productivity falls, and recovery of the grassland becomes a longer term and more expensive option. All herders and managers recognize the problem of degradation, and yet the primary concern of farm management remains how to increase production, increase livestock numbers, to meet economic targets set by the five year planning process of the Communist party.

8. 1 Coordinating the Objectives between Farms and Biosphere Reserve

If the designation of the area as a biosphere reserve is to be retained, the conflicting

* Carried out in Xilingol biosphere reserve by Rik Thwaites in 1996

objectives of the reserve and the farms must be rationalized. An overlying set of objectives must be developed, which need to be adopted by the farms within the biosphere reserve, to combine the conservation of biodiversity into their management. The Communist party has many arms which do not seem to communicate with each other. Environmental management strategies are developed in Beijing, such as the China Biodiversity Action plan, and the China Agenda 21. The biosphere reserves policy has been adopted as an ideal method for China to combine conservation of biodiversity with the need to maintain the livelihood of large rural populations. Yet the party still follows an economic planning process which takes no account of ecological capacity. An integrated approach needs to be adopted in landscape planning, taking account of a variety of objectives for human development, biological cultural diversity.

8.2 Completely Zoning Systems and Specific Management Rules

The Xilingol League government will have to play a strong role in ensuring this integration of objectives is achieved in the management of the grazing lands within the Xilingol Biosphere Reserve. The Baiyinxile Farm is managed by the Xilingol League Agriculture and Animal Husbandry Farms Bureau. The Xilingol Biosphere Reserve is partially responsible to the Xilingol League Urban and Rural Construction and Environment Protection Bureau. The Xilingol League must ensure that its own arms are not working against each other, that integrated objectives described above are developed to meet the multiple objectives of the biosphere reserve. Other levels of government will also need to make a greater commitment to the implementation of Xilingol Biosphere Reserve, recognizing and promoting the integrated objectives and providing improved funding and other support to assist in meeting the objectives.

The biosphere reserve is currently managed in an *ad hoc* manner. It has no management plan, identifying the vision and objectives for management of the landscape, or how it plans to achieve those objectives. Current zoning is ineffective, and does not realize the diverse objectives of the biosphere reserve. Any management plan must establish zones which contribute adequately to achieving all the biosphere reserve objectives. A complex zoning system may be required to meet the needs of both the biosphere reserve policy, and the NEPA Nature Reserve Regulations. Given that such zones will cover the areas of the Baiyinxile Farm, and other farms, these farms and the Xilingol League will need to be involved in the development of the management plan. As it is likely that Baiyinxile Farm will be the critical area providing core zones of different types such as reference and controlled grazing zones, the Baiyinxile Farm will play a key role in the development of the management plan. To achieve this successfully, however, the Baiyinxile Farm must have first integrated its own management objectives into, the

objectives of the biosphere reserve.

8.3 Strengthening the Participation of Local Herders in the Grassland Management

The Xilingol Biosphere Reserve, with the Baiyinxile Farm, Xilingol League and other bodies, will need to develop a management plan for the biosphere reserve, identifying clearly the landscape management objectives, and describing a variety of zones designed to achieve the diverse objectives. The physical zoning of the reserve should be considered as a flexible means to meet objectives, not as an end, or an objective in itself. The systems or institutions under which the grassland is exploited are very important in ensuring grassland resource. Tenure and resource rights are of primary importance in ensuring the right incentives exist for sustainable resource use. In Baiyinxile Farm, the herders currently have the right to own and manage their own livestock. The farm however has retained the right to manage the grassland. This separation of rights to manage the resource and the resource use has resulted in a lack of consideration of the future state of the grassland, and has been a major contributor to the degradation of the grassland. The response of the farm has been to propose the introduction of individual resource management rights, that is to allocate the grazing land to individuals, as has happened in other areas of the grassland under the HPRS (Household Production Responsibility System). In order to manage their land, the herders have had to exclude other livestock by constructing fences. In some cases this has resulted in an improvement in the condition of the land, but in other areas, the grassland continues to degrade. Apart from the expense of construction and maintenance, the fences also present other problems such as barriers to wildlife movement, and changing the nature of the open grasslands changing ecological and cultural identity.

By allocating designated areas of grassland to individuals, those individuals are being given the right to set their own priorities for management, to establish their own stocking rates for the grassland resource available. Even in the case of good management, they are likely only to consider maintaining the productivity of the grassland, which is sustainable yield. Achieving a sustainable yield will require a different management strategy, and result in different grassland conditions to setting out to achieve the integrated goals of the biosphere reserve including conservation of biodiversity. The environmental conservation goals of the biosphere reserve are social goals, and the burden to achieve goals cannot be expected to be shouldered by individual herders alone. One of the objectives of retaining land in public hands is to apply management practices to meet social goals. The biosphere reserve has the objective of

conservation of the diversity of the landscape, and the ecosystem and genetic diversity which it contains. This is a societal goal. It is imperative, therefore, that the grasslands in Xilingol Biosphere Reserve, which are still publicly managed, are retained in some form of public or community ownership. Allocating further grasslands to individual herders would have the effect of abandoning the diverse goals of biosphere reserves. Rather than integrating conservation with development, the land would be turned over exclusively to production goals. There would cease to be any point in the existence of the biosphere reserve.

8.3.1 Assurance of stakeholders participating in the management of grassland

Baiyinxile Farm should abandon its proposals to allocate grazing land to individual herders. A system of management of that land needs to be developed which provides the incentive to herders to manage the land well, while keeping the ownership of the grasslands in the community's hands and retaining the 'open' or unfenced nature of the grasslands.

Another problem in the management of the land in Baiyinxile Farm, is the lack of opportunity for herders to become involved in its management. Herders, though in some cases feeling a strong desire to look after the land, have no role in its management. The herders sometimes expressed frustration at the management of the grassland, and the unwillingness, or inability of the Baiyinxile Farm to hear, or consider their views. The herders have little opportunity to express themselves or participate in the management decision-making process. Participation of stakeholders in management is a key element of the theory of sustainable, and of the biosphere reserve policy. Many benefits recognized of such participation include providing strong ownership of the problems of management, and of the solutions devised.

8.3.2 To make sure the participation of herders in grassland managers' election

The management system developed in Baiyinxile Farm needs to ensure herders have a strong participatory role and real responsibility in the management decision-making and regulatory processes.

In Baiyinxile Farm, the land is divided into sub-farms for management purposes. Before the economic reforms were introduced each sub-farm was responsible for the management of their land and their livestock. Since the economic reforms were introduced, responsibility for management of the livestock has been passed over to individual herders, while the sub-farms have retained responsibility for management of the grassland. The sub-farms are the lowest level of the Communist party hierarchy,

and government management structure. Though systems do exist for some herder involvement at level, this does not provide herders with a genuine opportunity for participation in management. It does not set out to do so. The Communist party system is a top-down system of regulation and control. Unlike on collective farms, where at least there is a democratic election for positions such as village directors and other leaders, in Baiyinxile Farm, all leadership positions are nominated from above. The director of the farm is nominated by the leadership of the Xilingol League Agriculture and Animal Husbandry Farm Bureau. All other leaders, including the sub-farm directors, are then nominated by the leaders within the farm.

The sub-farm structure already exists, as physical division of the grassland, and as separate administrative bodies. One of the current problems of management has been identified as the separation of responsibilities for the management of the grassland resource (sub-farms), and the management of the use of that resource (herders). The proposal generally accepted in China has been to allocate exclusive rights to land, which moves the responsibility to manage the resource to the same group which manages the use of the resource. As described above, this system results in the abandonment of social objectives for the land, with an exclusive focus on the production objectives of the individual (These individual production objectives are heavily influenced by policies of the Communist party to increase productivity, raise incomes.). One alternative would be return management of the livestock to the sub-farms. This would be returning to the pre-reform days, of a centrally planned system, assuming the central planners have the ability and desire to take account of the environmental as well as the production objectives for the grassland. This option would, I believe, be politically unacceptable. The alternative remaining is to bring responsibility to manage both resource and resource use under a community, co-operative management system.

8.3.3 Improving responsibility in sustainable exploiting and management

A co-management model could provide both the congruence of responsibility for management of resources and the use of those resources, while providing the opportunity for genuine participation of the local community in management. Any such co-management model would need to be locally devised, not imposed by outside researchers. Though co-management models have been established in a range of resource use situations around the world, in Communist China, I believe such a model would be experimental, and would provide a great challenge to the thinking of the current leaders.

The responsibility to manage the grasslands sustainably would be imposed on the

herders by ensuring all herders were partners in the co-operative enterprise, and that necessary environmental requirements and restrictions were placed over the management of the grasslands. Other partners in the co-operative would have to include the Baiyinxile Livestock Farm management, as well as the Xilingol Biosphere Reserve.

When the economic reforms were introduced, each sub-farm held meetings to give the herders the opportunity to discuss how they should adopt the reforms. Such a process would need to be followed again in each sub-farm, giving the herders a role in the creation of co-operatives. There would be numerous controls needed, which the herders themselves would need to play a role in setting. Safeguards would need to be introduced. Who would have the right to be a partner in a co-operative? How would grazing by outside employees and organizations be controlled? How could the grazing levels for each sub-farm be set? How could opportunistic grazing strategies be incorporated into a co-operative management model? Such a process of consultation for resource use would have to take account of the integrated objectives for the biosphere reserve and the management planning process.

One mechanism for controlling livestock coming from free-market economies would be the tradeable grazing right. Within each sub-farm a gross number of grazing units could be set at a sustainable level. These grazing rights could then be divided equitably amongst the existing herders (not just the farm staff). Herders would then have the opportunity to sell their grazing rights to others, and invest the money in other activities, or in leaving the grassland, or to increase their grazing potential by buying the rights from others. There are a number of problems with such a system, related for example to the creation of a new breed of poor herders, without grazing rights, or of the possibility of undue pressure being placed on herders by more powerful people to sell their rights. If such issues could be overcome, a system of tradeable grazing rights may offer the mechanism for management of the livestock numbers which is necessary to ensure grazing is sustainable.

8.3.4 Exploiting marketing systems of livestock products for local herders

The Baiyinxile Farm must abandon its targets for increased livestock numbers. Livestock numbers should be controlled by the allocation of tradeable grazing rights within sub-farms. The absolute number of livestock per grazing right could vary according to natural and economic conditions, allowing for an opportunistic and responsive grazing system. The amount and timing of such variation would have to be decided by the partners in the co-operative enterprise. The market value of tradeable rights would depend on the grassland condition, so it would be in the best interest of herders to maintain the condition of their own grassland.

The current livestock marketing system is inequitable, with herders in Baiyinxile Farm dependent on visits from travelling buyers who do not necessarily come if the demand is low. The markets also do not include a sufficient premium on product quality to encourage herders to adopt quality rather than quantity as a key objective of livestock management. The opportunity exists to create a co-ordinated marketing system in Baiyinxile Livestock Farm, providing access for all herders, as well as a price premium on livestock quality which would then provide another economic incentive for herders to maintain or improve the condition of their grassland. The Baiyinxile Farm may need to use its meat processing and storage facilities to assist the herders to decrease the number of livestock at times when grassland productivity is poor, or free-market demand is low.

8.3.5 The role of Baiyinxile Livestock Farm in embodying the characteristics of biosphere reserve

The Baiyinxile Farm recognizes that the continued increase in the welfare and the incomes of the local community cannot be met by the expansion of the grazing industry alone. Rapid expansion of processing, manufacturing and tourism industries are proposed. However, for this expansion and increased income to have some impact on the grazing industry, reducing the need for constant expansion of livestock numbers, returns and benefits from these other industries must be passed on direct to the herders. That is, it is not good enough to establish an ecotourism industry in Baiyinxile Farm with the money going into the pockets of private investors or the farm. Genuine opportunities must be created for herders to participate in the activities of the ecotourism operations, and genuine benefits from the increased income to the farm must be passed on to the herders and their families.

The discussion throughout this thesis would suggest that Xilingol Biosphere Reserve does not function as a protected area or meet the requirements of biosphere reserve. Though it has established some development projects, it is having negligible impact on management practices of the grassland, or on protection of the landscape, ecosystems, species or genetic diversity, or the cultural life of the residents. It is a reserve in name only. Considerably greater commitment must be made at local levels of government in China to the broad objectives of the biosphere reserve, recognized at the national level.

This also suggests problems in the model of biosphere reserves, and perhaps in the creation of protected areas in developing countries. Xilingol is listed as a biosphere reserve, it is on all the UNESCO databases, it is recognized internationally as a key element in attempts to conserve the diversity of China's steppe grasslands. The biosphere reserve model seems to be treated seriously at the national level in China, as

there is commitment to implement the policy by designating both internationally recognized biosphere reserves and creating a national network of reserves based on the same model. Yet, on the ground, little is happening. International and national policies are not translating into meaningful local action.

Are biosphere reserve an effective model for achieving the integration of conservation with development on a landscape scale? Many nations seem to support the model, and have designated biosphere reserves within their own territory. A greater effort will need to be made in implementing biosphere reserves at the local level, and in monitoring their progress, to ensure these reserve are effective and biosphere reserves are achieving their objectives.

8.4 Conlcusion

The implementation of the international biosphere reserve program may need to be re-considered. Data gathered on XBR suggests that information contained within international databases such as those at UNESCO and the World Conservation Monitoring Centre (WCMC 1994) does not reflect the situation on the ground. XBR is not alone in experiencing problems with implementation of the policy in real situations, dealing with the real economic, political, social and cultural conditions existing before the reserve was established. What value are databases which contain information which may be out of date, misleading, or indeed a misrepresentation of the real situation. More research is needed into individual reserves and within the legal and political systems of individual nations on problems being experienced with implementation of the biosphere reserve policy. Recognizing that nations have sovereign rights over their land, and that a number of nations, such as China, have enthusiastically adopted the biosphere reserve policy as an integrated model for conservation within the community, more assistance is required from UNESCO and the international community in the implementation of biosphere reserves, particularly in developing counties.

Creative and positive solutions may need to be found to provide encouragement and assistance in the design and implementation of reserves, and to ensure objectives are met. A coordinated approach may be needed to identify problems associated with implementation of the policy in new reserves, and identification of how these problems can be overcome. Assessment of applications for designation of biosphere reserves could include assistance in the interpretation and implementation of the model to meet both local conditions and international objectives. Assessment could also include an extended period during which certain conditions should be met, before full designation is awarded. The logistic function may need to be strengthened with direct support from UNESCO to provide increased levels of international training and exchange, improving

the awareness and management capabilities of reserve management and staff. The setting of objectives and targets, and creation of management plans will need to take a higher priority in the establishment of biosphere reserves. Monitoring of progress towards achieving targets, and success in meeting objectives also needs to take a much higher priority for reserve managers. A system for independent assessment of progress may need to be introduced. In 1996, 329 biosphere reserves had been designated in 83 countries, covering over 218 million hectares (UNESCO, 1996b). But how many of these have actually achieved their objectives, or even begun to achieve them.

Achieving sustainable grazing this research has considered a range of issues related to grassland management and degradation. The key outcomes of the research relate to the issues of common property rights and participation. It is argued that without providing herders with well defined rights to resource use and a significant role in resource management, the grazing system will continue along an unsustainable course, with deteriorating grassland condition and viability of grazing enterprises. At the same time, the biosphere reserve cannot function unless integrated are adopted by the land managers, the livestock farms and herders. Another theme throughout this research has been that of ethnicity. This has been difficult to deal with on the basis of difference in grassland use or attitude based on ethnicity. With a population of predominantly Han Chinese, and the loss of much of the Mongolian grasslands culture, it seems unlikely that any realistic solutions to the problem of grassland management could be identified based on ethnic differences. By allowing herders to leave the grassland when they wish to, those remaining, whether Mongolian or Han, may have more options to follow in striving for a more viable and sustainable grazing industry.

This research by no means answers all the questions in relation to implementing the biosphere reserve policy, in Xilingol Biosphere Reserve or elsewhere. Considerable ongoing research will be necessary in Xilingol Biosphere Reserve to understand the changes being experienced on the grassland, and their impact, both ecological and social/political, and to assist the managers in their difficult job of achieving a sustainable land use system. The biosphere reserve model has been adopted by many nations around the world, implying that these nations see it as a useful model to help them achieve sustainable landscape management (though research looking at the reasons for adoption may provide alternative reasons). This research does not deny that in principle, the model should be able to support the integration of conservation with development through the achievement of sustainable landscape management, however the research in Xilingol suggests that the reality may be far from achieving this objective. The model itself is not enough to ensure that the objectives of the international policy are achieved. An understanding of those objectives, and firm commitment to them is crucial at the local level if any progress is to be made.

APPENDIX 1

THE CURRENT SITUATION OF XILINGOL BIOSPHERE RESERVE

1.1 Introducing the Background of the Nature Reserve

Xilingol National Grasslands Nature Reserve was established in 1985. It was China's first autonomous region (provincial) level grassland nature reserve. In 1987 the nature reserve was accepted by UNESCO's International Man and the Biosphere Programme (MAB) Coordinating Council as a member of the MAB network (China currently has 21 officially designated biosphere reserves). In 1993, the nature reserve became a founding member of China's Biosphere Reserve Network (CBRN). Then in 1995, Australia's Bookmark Biosphere Reserve established friendly sister reserve relations with the reserve. This was the first time a Chinese and overseas nature reserve had entered into a friendship agreement. In addition to the amiable relationship, the two reserves have maintained a strong level of exchange and cooperation. In 1997, the nature reserve was promoted to a national level nature reserve by decree of the State Council.

Xilingol Nature Reserve was originally set up by the joint financial support of the National Urban and Village Environmental Protection Department and the Rural Livestock and Fisheries Department. It was established as a national grasslands experimental nature reserve and received the strong support and endorsement of the Inner Mongolian Autonomous Region (IAMR) People's Government, the Xilingol League Government and the Xilinhot Municipal Government. Ten famous national grasslands specialists were then formally invited to draw up a general planning outline and project proposal. Then in 1985, the actual construction phase of the nature reserve was authorized by the IMAR People's Government. The then first director of the National Environmental Protection Agency (NEPA), Professor Qu Geping, issued the following congratulatory statement, "The creation of this grasslands nature reserve has ushered in a new era of grasslands protection in China". At the same time, the Chairman of the IMAR People's Government, Bu He, inscribed the name of the nature

reserve. In a gradually evolving process, the Rural Livestock and Fisheries Bureau was reformed and the Construction Department and Environmental Protection Bureau became independent organizations. Eventually the Xilingol Grasslands Nature Reserve came under the direct management of the environmental protection department. The total area covered by Xilingol Grasslands Nature Reserve is 10,786 km^2 and the complete area is within the jurisdiction of Xilinhot Municipality. Also completely encompassed within the nature reserve are the following units: Baiyinxile Livestock Farm, Maodeng Livestock Farm, Beilike Livestock Farm, Yilit Village and Bayanbaolit Village. Xilinhot Municipality and the northern section of Baiyinkulun Livestock Farm are also within the boundary of the nature reserve. Xilinhot Municipality is located approximately in the heart of the nature reserve with a large proportion of the reserve's region encompassing Baiyinxile Livestock Farm. The nature reserve's functioning areas are all located within Baiyinxile Livestock Farm. These areas include five core areas, two experimental production areas, one scientific research and tourism area, and one demonstration livestock farm totalling 30 km^2 representing less than 0.3% of the total nature reserve area.

1.2 The Functional Area of the Nature Reserve

According to the official decree of the 1985 IMAR Government the following areas were designated functional areas of the nature reserve: the five core areas of Hailiut Typical Grassland, Chaganaobao Meadow Grassland, Huitengxile Meadow Grassland, Taowuintaolegai remaining White Needle Spruce (*picea*) Forest, Birch Forest; as well as the two experimental production areas of Dongtaizi Degraded Meadow Experimental Rehabilitation Area and Huanghuagou (chrysanthemum valley) Experimental Hay Harvesting Area; the more recently, the demonstration livestock farm and the scientific research and tourism area. The first four of these core areas (except for Huitengxile Meadow Grassland core Area) and the two experimental areas were established in 1985 as part of the nature reserve. Soon after the nature reserve received national funding to fence the perimeters of these areas, however due to the lack of a professional management structure, further additional work was not possible, therefore resulting in the complete destruction of the fence. The Nature Reserve Management Department was established in 1993 and money was raised from every quarter so as to carry out the restoration of the five core areas of: Mountain Poplar and Birch Forest, Hailiut Typical Grassland, and Dongtaizi Degraded Meadow Experimental Rehabilitation Area. Moreover one person was specifically employed to protect these areas with the remaining areas of Chaganaobao Meadow Grassland and Huanghuagou Experimental Hay Meadow Area beyond our ability to restore to this day. Again during the rebuilding of these five

areas, more destruction was often encountered and required no small amount of repair. Besides, the nature reserve's senior leader and Baiyinxile Livestock Farm both signed a 30-year contract for the use of Huanghuagou Experimental Hay Meadow Area and Baiyinxile China-Foreign joint venture for their use as a meadow for horses. In 1997, the Dongtaizi Degraded Meadows became an experimental restoration area, however in the following year it encountered serious destruction. Moreover, during the next two years the area was forcibly entered and the grass harvested. By 1999, the appearance of the area was already completely ruined and is yet to recover. Presently, the only areas that are completely protected are the core areas of the Poplar Forest, the Spruce Forest and Hailiut Experimental Grasslands. In addition, the Ecotourism Service Centre (Zakstai Resort) has also worked hard to protect the area. In 1999 a new leader took over the management of the nature reserve, who recognised the significance of the nature reserve. With the exception of the Experimental Demonstration Livestock Farm, the new manager was able to gain access to the land of the seven other core areas, while maintaining the original three core areas. Through the hard work of the nature reserve, it has been possible to achieve a solid step forward, bringing an assurance of credibility to the management of the nature reserve.

1.3 The Scientific Research and Monitoring Work of the Nature Reserve

The creation of the Xilingol Grasslands Nature Reserve aroused the strong interest and attention of many specialist scholars and research institutions at both home and abroad. Many specialists from the Chinese Academy of Sciences (CAS) travelled to the nature reserve to carry out field site investigations. This was especially the case of local CAS specialists, most notably Inner Mongolia University's Natural Resources Research Institute who carried out a great deal of work. Moreover, specialists from Japan, Russia, Mongolia, America and Australia visited the nature reserve to carry out joint research, producing a large quantity of scientific results. Thus a strong base for the scientific management of the nature reserve was established. During the 1990's, the Xilingol League Ecosystem and Monitoring Station was established. They then took over the annual monitoring of changes to the vegetation within the nature reserve. Despite the many changes to the nature reserve, this scientific research and monitoring has been ongoing up until today, even despite the difficulties, invaluable information has been accumulated to ensure the ongoing progress and development of the nature reserve.

1.4 International Exchange and Cooperation

Xilingol Nature Reserve has developed extensive exchange and cooperation linkages

both at home and abroad. In 1994, the reserve through the locally based CAS research station, established contacts with Charles Sturt University in Australia in order to carry out joint scientific research work relating to nature reserves. Through this early research cooperation and much hard work, a friendly sister reserve relationship was formed in 1995 between Xilingol Nature Reserve and Australia's Bookmark Biosphere Reserve. The friendly relations were proclaimed with the following objectives: "The establishment of the relationship is aimed at the common development and sustainable utilization of a semi-arid ecosystem. In addition to financial support and the exchange of personnel, these friendly relations shall continue to acquire strength". The activities and projects that have been carried out so far have confirmed this statement. In both 1996 and 1999, Bookmark Biosphere Reserve has provided training for 3 scientific research personnel for respectively 2 and 3 months duration. During the 4 years from 1996 to 1999, three Xilingol League leaders and the head of IMAR Environmental Protection Bureau have led a delegation to Australia's Bookmark Biosphere Reserve to carry out field site investigations and research. During the same period, local government officials, nature reserve managers and professional personnel have thrice visited Xilingol Nature Reserve to carry out field site investigations and cooperation. From 1—15 August 2000, Bookmark's monitoring specialist also paid a professional visit to Xilingol Nature Reserve for fifteen days. By carrying out these exchange visits both sides of the friendly relationship have strengthened and deepened the friendship. Moreover, by furthering this cooperation and exchange, the relationship has significantly deepened between these two regions in China and Australia, and for Xilingol it has created favourable conditions for attracting trade and funding. This highly successful long-term international exchange and cooperation has brought the approval and support of scholars from both home and abroad.

1.5 The Organisation, Personnel Strength and Economic Condition of the Nature Reserve

The League Government has enthusiastically supported the nature reserve since its establishment, especially when it strengthened the nature reserve's management in 1999 by removing the original management department of the nature reserve and created the nature reserve management bureau. For a sub-department enterprise unit, this decision brought in much needed finance and removed the previous system of self-funding. The management bureau then established the subordinate administrative management division and resource management division which were staffed by four personnel transferred from the environmental protection and monitoring station. However, according to the official decree, the situation for the public security sub-station would

not change. They would receive no funding other than what they can generate themselves. In 2000, the nature reserve management bureau received a deputy director transferred from a League hotel. This brought the total number of nature reserve management personnel to five.

Xilingol Nature Reserve is China's second largest nature reserve by size. Despite this it only has five personnel, including one senior engineer, two mid-ranking engineers and one primary-ranking engineer. This relatively low-level of qualification is not appropriate for such a high profile nature reserve and severely impairs the development of the nature reserve. This is most obvious in regard to the public security sub-station. The IMAR public security bureau and the League government's departments showed they were concerned about the issue by establishing a public security sub-station in 1996 by decree of the IMAR Public Security Bureau and the league government. However, these four personnel have never been able to exercise their full authority. The public security sub-station should represent the nature reserve by executing the rule of law within the nature reserve to protect public order, halt poaching, arbitrary grazing, excessive digging and disorderly cultivating and other non-compliant behaviour so as to facilitate more appropriate work like conserving the wild flora and fauna within the nature reserve. Despite the public security sub-station being reinforced and compliant with the relevant "China Nature Reserve Regulations", this security unit is unable to implement or uphold these laws and regulations. This issue poses the most serious challenge to the daily work of managing the nature reserve. At present, poachers, illegal medicinal and herbal harvesters and farmers preparing the soil for cropping and other law breakers are seriously rampant. Despite this the four public security personnel even lack a steady income, let alone the ability to carry out the law or handle a case. It is very difficult to estimate the damage and cost of these problems to the work of the nature reserve. Furthermore, as mentioned above, despite the large size of the nature reserve it is only managed by five personnel. This is compounded by the large amount of administration and daily activities the department has to deal with, thus making it difficult to ensure the development of our protection work in the nature reserve. A nature reserve of an equivalent size overseas would easily have at least a dozen or more public servants who could carry out the management and patrolling functions. In comparison with other Chinese national nature reserves, our fundamental situation is terribly backward. Only with adequate funding and investment of our human and material resources, will the personnel be able to fulfil the objectives of conservation management. However, the situation is just the opposite. China would be hard pressed to change this situation, as the majority of the nation's nature reserves lack a reliable source of human and material resources and therefore they all share a similar predicament.

The undertaking of nature conservation work benefits the present as well as a responsibility to increase the benefits for future generations. However, without the support of essential human and material resources it is impossible to implement such an undertaking and responsibility. Xilingol Nature Reserve is one of only two UNESCO designated MAB nature reserves located in IMAR. At both home and abroad this nature reserve enjoys a high-level of respect, commands a great deal of attention and is highly significant within the international MAB programme. Moreover, Xilingol Nature Reserve is alone in establishing and protecting a mutual, long term and friendly cooperative relationship with an overseas nature reserve. Furthermore, this nature reserve receives the strong approval and support of many famous domestic and international specialists. However, because we have been unable to keep up with recent developments, largely due to the lack of qualified personnel, the nature reserve is experiencing more and more problems. We anxiously appeal to the relevant authorities to pay attention to these problems and strengthen the leadership of Xilingol Nature Reserve, protect Xilingol's grasslands and safeguard China's largest natural northern frontier ecosystem.

Currently, Xilingol Nature Reserve has accumulated a total debt of RMB ￥1,464,774.6 and this does not include the loses of RMB ￥247,042.33 which were already repaid in 1999. Most of this money was spent on sustaining the livestock at the nature reserve's livestock farm. At present, the nature reserve is still required to implement self-funding arrangements for 14 personnel and therefore they only receive 70% of their wages. Moreover, from January 2001 until now, they have not even received this 70% portion of their salaries. Therefore, the nature reserve's current economic situation is desperate and the personnel feel a kind of suffocation.

1.6 The Economic Base of the Nature Reserve

(1) The nature hotel

Since 1997, the nature hotel has encountered more and more problems along with a poor management administration. The 1999 audit report noted that the hotel had already accumulated bad debts of approximately RMB ￥1 million, well beyond its ability to pay back and is currently on the brink of bankruptcy. The appointment of the new head of the nature reserve, however constrained, has within a short time attempted to consult with many authorities, including, the League's Institutional Reform Committee, the Arbitration Office, Employment Bureau, and the Social Security Bureau, etc. After discussing the many basic issues, it was agreed after the agreement of the worker's union, that the hotel would undergo some major reforms. These reforms include the retrenchment of some of its employees and the reinstatement of the contracting system.

After these reforms, the ongoing difficult phase was reversed. The nature reserve has also carried out this phase of reforming its administration, so that conservation management is now the main issue at stake. After passing through the course of the past two years, it is obvious that this approach is the correct one. However, after so many stagnate years of neglecting the main function and concerns of the nature reserve, a heavy burden still remains.

(2) The experimental demonstration livestock farm

The experimental demonstration farm began operating in 1997. However, owing to many reasons the venture gradually went down hill. Especially owing to the problem of declining pastures, and the problem of ongoing difficulties with the neighbouring herders, eventually forcing the farm to gradually reduce the number of livestock it carried. In the middle of 1998 and 1999, as a result of the problem with the boundary of Chifengke Banner, Ke Banner organised more than a dozen herders to break into the demonstration farm. These herders then set about smashing and destroying property and equipment within the farm causing direct economic losses of approximately RMB ¥500,000. Despite the nature reserve management bureau's many attempts to follow up the incident with the People's Government, inspectors, Public Security, Environmental Protection Bureau and other authorities, all attempts for a response failed. Nobody cared to respond and the incident was conveniently forgotten. As a result of suffering such a disaster, the demonstration farm's production ability was on the verge of paralysis. The farm's meadows were gradually reduced with less than a total of 1000 livestock and a reduced number of employees. Model grazing land had no choice but to withdraw from the enterprise. Currently, the farm has one employee who stays to look after 100 sheep and maintains the buildings.

(3) The scientific research monitoring and ecotourism service centre (Zakstai Tourist Resort)

The Scientific Research Monitoring and Ecotourism Service Centre (Zakstai Tourist Resort) was launched in 1993 with just a couple very basic and low quality Mongolian yurts. In 1995, the Xilingol League Budget Committee established a project worth RMB ¥150,000 to construct a nature reserve exhibition centre. The centre would be stocked with the existing nature reserve interpretation materials and references that were originally housed at the Nature Hotel in Xilinhot. These information materials and references helped improve the quality and standard of this core area and gradually transformed it into a multifunctional service centre and base for the demonstration of tourism, information, scientific research and monitoring and public education. Over the years, the centre has upgraded its facilities through new investment, establishing new equipment and adding new interpretation materials for display. By 1999, the centre had become a place of spiritual civilization throughout the grasslands by facilitating the

exchanging of experiences and receiving officials. The cost of constructing the more than 600m^2 exhibition centre and scientific research and monitoring personnel room was RMB ¥500,000. However, the funding situation to this day is still not assured. At present, the basic functions of the centre are all complete, including the public education and reference collection. This has helped open up a window and promote both the nature reserve and Xilingol League to the outside world. The centre has already become a solid base of environmental and patriotic education within the League. Since the establishment of the reserve, this centre is the only ongoing proper function of the nature reserve in the region. It is hoped that the centre will attract the due recognition and support of the authorities through assured capital investment, so as to ensure the ongoing ability of the nature reserve to carry out such an important function and operation.

(4) The experimental farming station (afforestation site)

The experimental farming station is located just 5km north-west of Xilinhot Municipality along the Southern Xisai Highway. Previously, the station was established as a base for the establishment of a green belt around the city. In 1991, the nature reserve took over the management of the station with the aim of continuing the work of the establishing a green belt. The economic benefits of the station will not be discussed here, however the station has produced very favourable ecological and social results. After many years of investment from the nature reserve and very few outputs, the station as a whole has had very little impact upon the construction and development of the nature reserve.

1.7 Adopt Effective Measures to Strengthen the Nature Reserve

In order to strengthen the effective management of the nature reserve, we suggest the adoption of the following measures:

(1) Completely incorporate the public security officers within the management structure of the nature reserve, so as to strengthen policing, increase the strength of carrying out the law, deal with some of the representative sites, expand the awareness of the nature reserve, and raise the quality of management of the nature reserve.

(2) Utilize this opportunity to adopt various measures to: enhance awareness and education, raise the standard of the people's environmental knowledge and strive to increase the people's voluntary participation in environmental protection.

(3) While paying for entry into the Tourism District, we should impart awareness and education of the aims and objectives of the nature reserve.

(4) Establish a nature reserve management station within the Baiyinxile core area.

(5) Jointly formulate a plan for the Tourism District together with the Tourism

Bureau and Baiyinxile Livestock Farm, so as to ensure that there is agreement regarding the utilization of the area's natural resources.

(6) Build up the cooperation with the relevant departments and make every effort to ensure the adoption of the "Regulations Regarding the Implementation of the Xilingol National Grasslands Nature Reserve Management Bylaws" by the IMAR People's Standing Committee. This will ensure the proper execution of the law and abidance by the orders.

(7) Expand the coverage of the core area, so as to abide by the national requirement for all nature reserves to have a core area coverage of at least 10% of the total nature reserve area.

(8) Energetically work towards strengthening the scientific research and monitoring work within the nature reserve and raising the quality of the scientific management of the nature reserve.

(9) Make full use of the current Sino-Canadian joint project to strengthen the relationship and cooperation with the local people, as well as strive to improve the quality and grade of every facet of the nature reserve's work.

1.8 Attention and Support are Necessary for Carrying out the Work of the Nature Reserve

Nature reserve work is honourable in the present age, but the benefits will flow into the community for ever. The nature reserve requires the attention, understanding and support of society, but especially the strong support of the relevant authorities. We believe the following items require the full understanding and support of the League Government before they can be resolved, otherwise despite all the hard work of the nature reserve they will be impossible to accomplish:

(1) It is essential to have a total operating budget of RMB ¥220,000 for the daily running of the nature reserve, which includes funding for the following:

a. RMB ¥50,000 for administration

b. RMB ¥110,000 for the maintenance of the core areas (including: the reconstruction of five core areas with each requiring RMB ¥20,000 each and the maintenance of two other core areas requiring a total of RMB ¥10,000)

c. RMB ¥50,000 operating budget for patrolling (including: the salary of the officers; the ongoing running costs and maintenance of their vehicle, and a patrolling allowance etc.)

d. RMB ¥10,000 for fire prevention

(2) An authorised public security station.

(3) A single management for the nature reserve's Tourism District. Presently, the

nature reserve's Tourism District lacks a unified monitoring management, which has resulted in serious degradation to the natural ecosystem. We suggest that every planned tourist development or activity should be first approved by the nature reserve management bureau, so as to ensure they abide by the proper procedures.

(4) The convening of a regular joint meeting organised by the League Government to include the Rural Management Bureau, Baiyinxile Livestock Farm, and Xilinhot Municipal Government etc. The meeting should allow the nature reserve management bureau to report on its work and call for opinions and responses, so as to improve the work of the nature reserve.

APPENDIX 2

MAJOR LANDMARKS OF XILINGOL BIOSPHERE RESERVE

1. 2 November 1984 The Inner Mongolian Autonomous Region's (IMAR) People's Government decided to establish a Leading Planning Group on researching grasslands nature reserve. The Leading Planning Group was required by the end of 1985 to have completed the research and planning work for grasslands nature reserve and have established a grasslands nature reserve within Xilingol League's Baiyinxile Livestock Farm. This reserve would become an experimental site for the establishment of other grassland nature reserves in China.
2. 25 December 1984 Xilingol Grasslands Nature Reserve was officially established at a specially convened Xilingol League Construction Bureau conference in the IMAR Construction Department by the Planning Group director, Chang Lianhao and Xilingol League director, Nai Deng and his deputy director, Zhang Yingqi. Also in attendance at the conference were the leaders, technical engineers and personnel from Xilingol League Planning Bureau, Rural Management Bureau, Construction Bureau, Grasslands Work Station, Municipal Government, Municipal Construction Bureau, Baiyinxile Livestock Farm as well as the advisors and staff of the IMAR Nature Reserve Research and Leading Planning Group. The conference discussed and decided on the extent, designation, objectives and management structure etc. of the protected area.
3. 14 January 1985 The Xilingol Grasslands Nature Reserve proposal was finalized.
4. 9—10 April 1985 The IMAR Construction Office convened the "Conference on the Planning Design for the Xilingol Nature Reserve Experimental Project" in Hohhot City.
5. 17 April 1985 The IMAR Construction Office formally passed on the report titled, "The construction of the 《Xilingol Grasslands Nature Reserve》 to the IMAR People's Government".
6. 18 May 1985 The IMAR People's Government officially replied giving their consent for the establishment of the IMAR Xilingol Provincial Grasslands Nature Reserve.

7. 5 August 1985 A meeting was convened at Baiyinxile Livestock Farm to celebrate the establishment of the Xilingol Grasslands Nature Reserve.
8. August 1985 The chairman of the IMAR People's Government, Bu He, inscribed the name of the nature reserve.
9. August 1985 To celebrate the establishment of Xilingol Grasslands Nature Reserve, the director of the National Environmental Protection Agency, Qu Geping, wrote the following: "The creation of this Grasslands Nature Reserve has ushered in a new era of grasslands protection in China."
10. December 1986 The economic enterprise division of the nature reserve invested and built the "Nature Hotel".
11. June 1987 UNESCO's Beijing representative, Dr Tailor, carried out a review of the reserve.
12. July to August 1987 A joint group of Sino-Japanese scientific specialist carried out surveys and research on the vegetation and soil within the nature reserve.
13. 7 September 1987 Xilingol Grasslands Nature Reserve was formally designated a member of UNESCO's International Man and the Biosphere Programme.
14. December 1988 An experimental demonstration livestock farm was established by the nature reserve.
15. 1991 The nature reserve took over the management of the afforestation station from the Xilingol Urban Construction Bureau. It then turned this into a economic enterprise, the Nature Reserve Afforestation Station.
16. 1992 The Nature Reserve began to monitor the stability of vegetation within and around the reserve.
17. 23 June 1992 The League Party Committee officially ordered that the "Nature Hostel" should be transferred from a collectively-owned enterprise into an independent enterprise work unit according to the new management structure of enterprises.
18. 3 March 1993 The League Party Committee officially declared Yan Yongwang the deputy officer of the nature reserve.
19. 12 July 1993 The reserve became a founding member of the Chinese Biosphere Reserve Network (CBRN).
20. July 1993 The nature reserve established a tourist resort on the eastern banks of Zhakstai Lake within the Baiyinxile Livestock Farm.
21. 31 July 1993 The chairman of the National Committee for China MAB, Sun Honglie, carried out an inspection tour of the reserve.
22. September 1993 The director of Charles Sturt University's Johnstone Centre of Parks Regeneration and Heritage, Professor Terry De Lacy inspected the reserve and agreed to carry out a two to three year research project in the reserve titled,

"Conservation and Development: the relationship between the local population and the nature reserve".

23. 21 March 1994 The League Party Committee officially decreed the creation of a specific institution for the nature reserve, at junior-department level. A nature reserve management unit was established with 8 personnel and an annual operating budget of RMB ¥15,000 provided by the League's public finances.
24. 25—31 July 1994 A national grasslands nature reserve management training course was carried out in the nature reserve. An evaluation of the nature reserve was also performed during the session by the attending specialists.
25. 31 July 1994 The nature reserve established a coordinated science and technology unit jointly composed of the nature reserve management division, Inner Mongolia University and the Chinese Academy of Sciences Inner Mongolia Grasslands Ecosystem Research Station (IMGERS). The nature reserve invited these two units to provide the support for this scientific research unit.
26. April 1995 The head of the nature reserve management division, Yan Yongwang, was invited to Australia. During his 15 day trip, he carried out site investigations relating to Australia's system of protected areas.
27. 18 May 1995 The nature reserve began another economic enterprise with the opening of the "Nature Teahouse" in Xilinhot.
28. 5 August 1995 The nature reserve celebrated its tenth anniversary by convening a meeting and scientific workshop at the Zakstai Tourist Resort. The director of NEPA, Jin Jianming attended this celebration.
29. 25 September 1995 The nature reserve and Australia's Bookmark Biosphere Reserve formally established friendly sister reserve relations.
30. March to May 1996 The nature reserve and the Inner Mongolia University's Natural Resources Research Institute cooperated to produce the "Development Program for Xilingol Grasslands Nature Reserve".
31. 1—3 August 1996 The deputy director of NEPA, Wang Yuqing, inspected the nature reserve.
32. 9 August 1996 Qu Geping, Chairman of the Environment and Resources Protection Committee of the National People's Congress (NPC), inspected and surveyed the nature reserve.
33. 19—26 September 1996 Three senior members from Australia's Bookmark Biosphere Reserve management committee, Kevin Smith, Mike Harper and Bill Durieu paid their first official visit to the nature reserve.
34. November 1996 The League Party Secretary, Bao Junwo was formally invited to lead a five-member nature reserve delegation to visit Australia and carry out a field inspection of the relationship between Bookmark Biosphere Reserve and the

surrounding area. This was the first reciprocal visit within the formally established exchange relations between the two sister reserves.

35. Late 1996 to early 1997 One nature reserve personnel spent two months visiting Australia's Bookmark Biosphere Reserve studying the professional and operational management of the reserve. This study tour was made possible through the generous financial support of UNESCO.
36. September 1997 The executive officer of Australia's Bookmark Biosphere Reserve Trust, Mike Harper and one other official returned to carry out a week long field trip survey of the nature reserve.
37. 8 December 1997 The nature reserve was officially promoted to a national level nature reserve by decree of the State Council.
38. 26 December 1997 The League Organising Committee officially decreed the "Five Point Plan" for the nature reserve. This turned the nature reserve management unit into a self-funding unit and resulted in the establishment of four subordinate divisions: an administrative office, a management division, a scientific research division and a law enforcement division. In total there would be 21 personnel.
39. 12—20 January 1998 A delegation led by the IMAR Environmental Protection Bureau Director, Wu Guozhong, and the Xilingol League Deputy Director, Gao Yun, carried out a field trip survey to Australia's Bookmark Biosphere Reserve. The delegation spent 15 days studying the reserves transition area.
40. 24 July 1998 Post Ministry of China issued a special nature reserve stamp edition. The series was titled "Xilingol Meandering River" and included a set of three stamps labelled "Meadow Grasslands", "Typical Grasslands" and "Mixed Forests of Poplar and Birch".
41. July to August 1998 A member of Australia's Bookmark Biosphere Reserve Trust, Ms Robin Foley, led a 6 member 15-day field trip study to the nature reserve. The aim of the visit was to further cement the strong and friendly cooperation and exchange between the two sister reserves and their respective regions.
42. 17—31 March 1999 The deputy secretary of the Xilingol League Party Committee and the standing deputy director of the League Government, Su He, led a delegation on a 10-day field survey of Bookmark Biosphere Reserve and its transition area.
43. April 1999 At a Xilingol League Tourism Conference, the League Party Committee and League Administration announced the creation of a Tourism Development Zone in and around the region of the nature reserve and Baiyinxile.
44. 12 June 1999 The League Organizational Committee formally decreed that the existing nature reserve management unit would be upgraded and replaced by the

establishment of the nature reserve management bureau at junior-departmental level. The management bureau received four personnel who were transferred from the League Environmental Protection and Monitoring station. The Finance Administration would allocate the operating budget for an administrative management division, resources management division and a nature reserve police station. However, the remaining personnel will have to generate their own income and revenue. At the same time, the existing director, Yan Yongwang would be transferred to the position of government assistant investigator. The director of Xilingol League Urban Construction Bureau, Feng Wensi, would be appointed as the director of the nature reserve management bureau.

45. August 1999 The "Man and the Biosphere Exhibition Centre" was completed with an attached scientific research room. The centre is located at Zakstai Lake Tourist Resort and measures 600m^2. The centre would function as a base of promoting environmental education and patriotism within the League.

46. 12—27 December 1999 The nature reserve approved the National Foreign Experts Bureau funded project, "A sustainable development plan for Xilinhot City". The project was completed in partnership with Mr William Ross from Australia's Murdoch University and the nature reserve personnel.

47. August to November 1999 Two personnel from the nature reserve travelled to Bookmark Biosphere Reserve for three months of operational training. The trip was jointly funded by the National Foreign Experts Bureau and Bookmark Biosphere Reserve.

48. 14 October 1999 During the past several years, the economic management of the nature reserve's enterprises was quite poor, therefore the management division accrued debts of more than RMB ¥1 million. After the management division had carried out six months of extensive consulting with the League government to change the opinions of the relevant agencies, including the Party Committee, Human Resources Bureau, Employment Bureau and Social Security Bureau, eventually a conference of all relevant institutions was convened. The whole group then agreed to reform the management of the Nature Hotel and Nature Teahouse. Some of the employees would be retrenched and the enterprise would come under the management of a collective contract.

49. 31 December 1999 The Land Management Bureau of Xiwu Banner (*qi*), Xilingol League, awarded the nature reserve a certificate for the utilization of Hailiut typical grasslands core area in Wulanor Commune (*sumu*).

50. 18 March to 5 April 2000 A five member delegation led by the Nature Reserve Management Bureau Director, Feng Wensi, carried out a 15-day field trip survey to Australia's Bookmark Biosphere Reserve and region. In addition to deepening our

friendship ties, the delegation further developed the bilateral relationship through ongoing cooperation and exchange.

51. 15 April 2000 Zhong Qinmin was appointed to the nature reserve as the deputy director.
52. Mid—May 2000 After researching the situation, the nature reserve decided to contract out the management of the demonstration livestock farm and aim to reform the management of the Zakstai Resort and Afforestation Station.
53. June 2000 The nature reserve established a party division.
54. 31 July to 13 August 2000 Ms Sonia Teresa Dominelli, a environmental monitoring specialist from Australia's Bookmark Biosphere Reserve carried out a 15-day field trip to the nature reserve. The purpose of the trip was to complete National Foreign Expert Bureau's funded project "The establishment of a fauna monitoring system for Xilingol Biosphere Reserve".
55. April 2001 After the bureau affairs research meeting, it was decided by all the employees that the nature reserve shall contract out the management of Zakstai Resort and the Afforestation Station and furthermore, that the nature reserve management bureau will never again participate in private enterprise activities.
56. April 2001 The National Committee of China MAB launched the commencement of a research study into nature reserve policy within Xilingol Biosphere Reserve.
57. June 2001 The director of the nature reserve, Feng Wensi, travelled to Canada as part of a field trip study of their nature reserves. This training project of nature reserve managers was the first part of the implementation of the Sino-Canadian Biodiversity Protection and Poverty Alleviation in Inner Mongolia Project.
58. 29—31 July 2001 The members of the Sino-Canadian project commenced the project by carrying out a field site survey of the nature reserve and engaging the nature reserve personnel in discussions and exchange.
59. 4—6 August 2001 The Fifth CBRN Conference and 20th Anniversary of the Man and the Biosphere Programme Workshop were convened.
60. 9 August 2001 The League Government officially announced the establishment of the Nature Reserve Management Committee. The committee will be managed by: the deputy secretary of League Party Committee and deputy director of the Government's Standing Committee, Su He, as chair, and; the deputy directors of the League Government, Chaolunbatur and Gao Yun as deputy chairs. Members of the management committee would also include the League's: Planning Bureau, Finance Bureau, Urban Construction Bureau, Forestry Bureau, Tourism Bureau, Public Security Bureau, Rural Farming Management Bureau, Livestock Bureau, the Nature Reserve Management Bureau, Baiyinxile Livestock Farm, Xilinhot Municipal Government and Xiwu Banner People's Government. The committee set

up an administrative office with management bureau director, Feng Wensi in charge.

61. 4 September 2001 The Poplar and Birch Tourist Area viewing platform and walkway were officially inspected and they received the full approval of the relevant authorities and technical personnel.

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MANAGEMENT OF THE DEGRADED ECOSYSTEMS IN XILINGOL BIOSPHERE RESERVE

锡林郭勒生物圈保护区
退化生态系统管理

本书是中国生物圈保护区可持续管理案例研究中的第一个案例研究成果。由中国人与生物圈国家委员会、中国科学院植物研究所、北京大学、内蒙古大学、澳大利亚墨尔本大学、澳大利亚查尔斯史特大学以及锡林郭勒生物圈保护区的专家学者通力合作完成。

本书对锡林郭勒生物圈保护区草场退化的现状、原因进行了研究和分析，并从可持续利用和发展的角度提出可能的解决途径和草地生态系统的管理办法。本书用中文和英语撰写，前一部分为中文部分，后一部分为英语部分。全书分为8章，前2章描述锡林郭勒生物圈保护区建立之初的背景及目前所面临的问题；第3章至第5章用可持续利用和发展的观点阐述生态旅游和城镇化取代畜牧业的可行性；后3章为保护区的管理提出建议。

本书可供自然保护区的管理者、大专院校自然保护与生态学专业的师生、国家有关决策部门领导、从事生物与地理教学的中学教师以及从事自然保护事业的新闻工作者参考。

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